THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2159.] LONDON, SEPTEMBER 27, 1904. [56TH YEAR. PRICE 6d.

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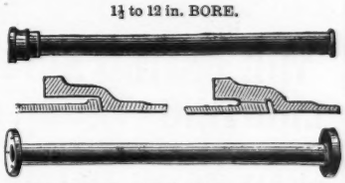

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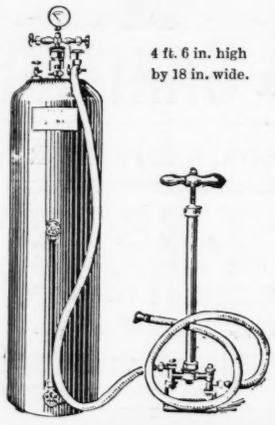

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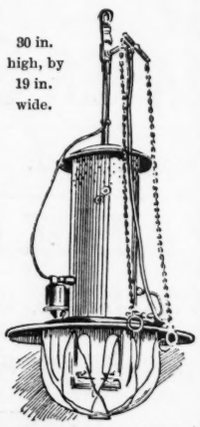

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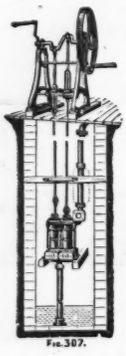

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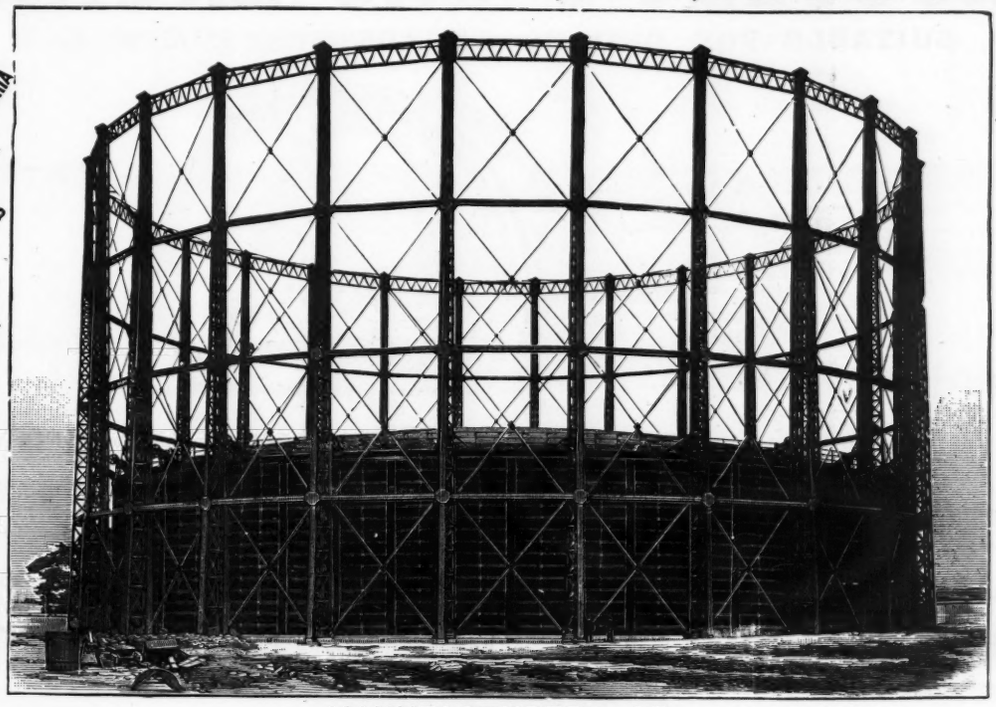

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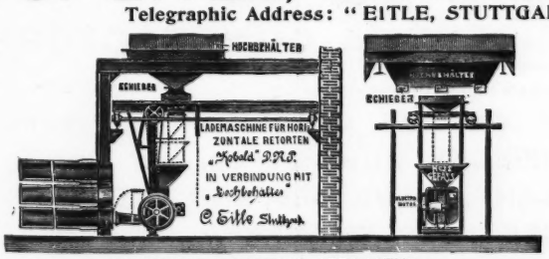

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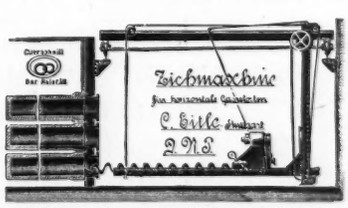

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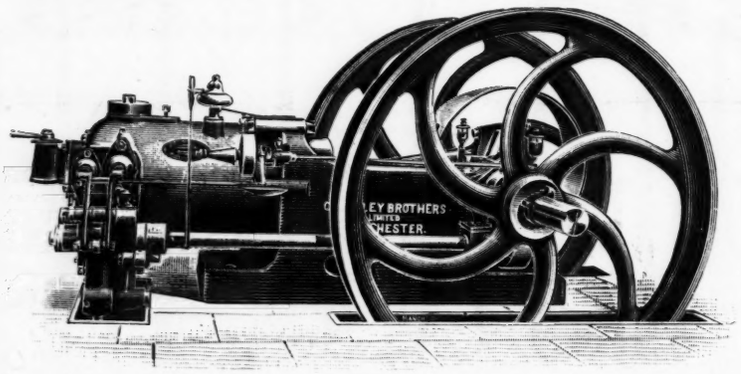

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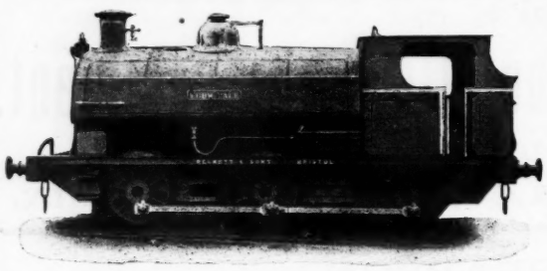

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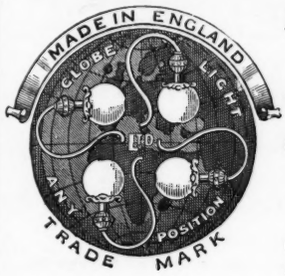

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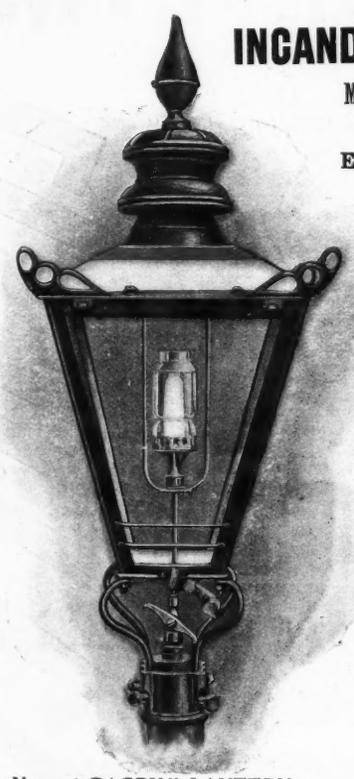

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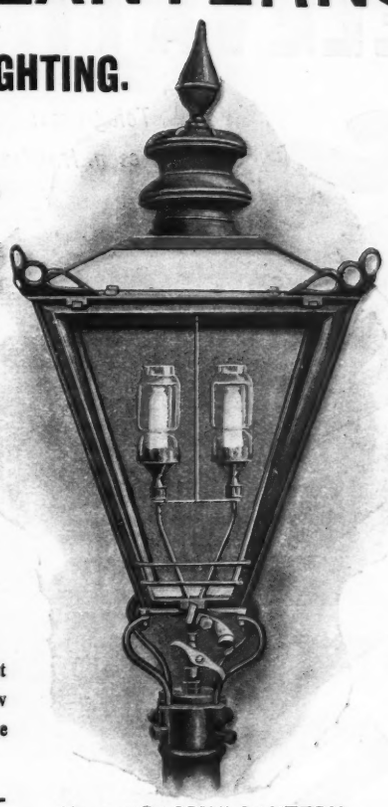

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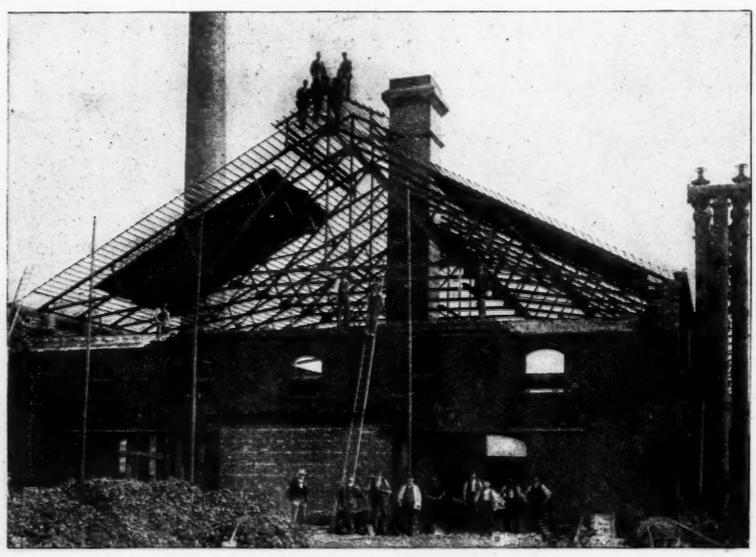

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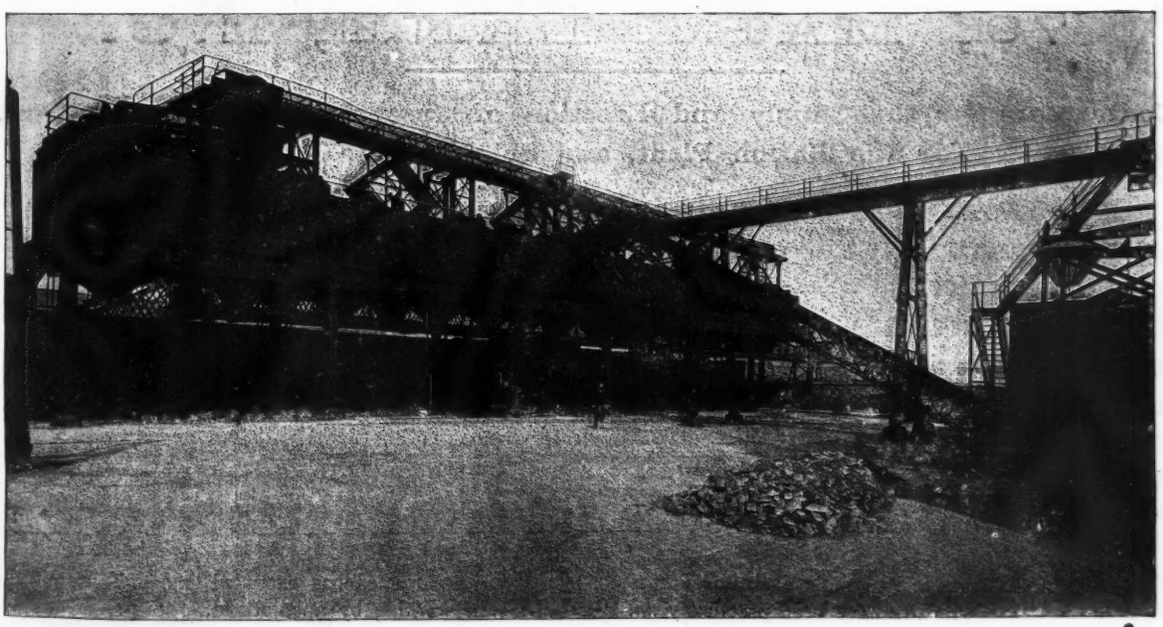

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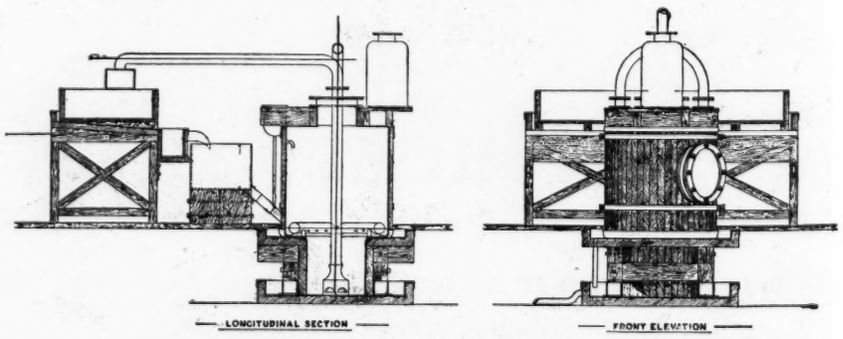

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Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

CONTENTS.

EDITORIAL NOTES.

Gas, &c.—
Depreciation and Sinking Funds . . . 861
Eastern Counties Association Meeting . . 861
The Earl's Court Exhibition 862
A Question of Public Safety 862
Mr. Hawtayne and the Check on Municipal Imprudence—The Example of Erith—In Favour of High-Pressure Distribution—The South Suburban Company and the Local Authorities—Progress and Prosperity at Shrewsbury—The Lighting and Extinguishing of Street-Lamps . . . 863

ESSAYS AND REVIEWS.

The Merits of Carburetted Water Gas. . . 865
A Gas Company and Power-Gas Supply . . 865
Gas Stock and Share Market 866
The Lewes Self-Carburetting Process. . . 866
Henry Alfred Willey 867
Gas Acts for 1904 869
A Gas-Driven Electric Light Plant. . . . 870
Rostin's System of Automatically Lighting and Extinguishing Street Lamps . . . 871
The Provan Gas-Works of the Glasgow Corporation—Third Article 873

TECHNICAL RECORD.

Eastern Counties Gas Managers' Association—Half-Yearly Meeting at Boston—
General Business 877
Inaugural Address of Mr. J. S. Dougall . 877
Mr. F. Paternoster on a Few Difficulties Associated with the Supply of Gas to a Rapidly Increasing District 879
The Action of Carburetting Agents in Gas upon Dry Meters 882
Manchester and District Junior Gas Association 884
Use of Tar in Macadamized Roads . . . 884
Calcrific Value of Different Fuels 884
High-Pressure Gas Distribution in California 885
The Gas-Fire Season 886
The Podmore and Thomas Patent Lamp. . 887

LEGAL INTELLIGENCE.

The Failure of the Scott-Snell Self-Intensifying Gas-Lamp Company, Limited . . 888
Gas Company's Unsuccessful Claim at Chertsey 888
A Gas-Cooker Canvasser's Claim 888
A Troublesome Defaulting Consumer. . . 888
Alleged Thefts from Gas-Meters 888
Thefts from Prepayment Meters at Newport (Mon.). 888
Refusal to Pay a Water-Rate 888

REGISTER OF PATENTS.

Explosion Engines—Bickerton, H. N., Bradley, H. W., and Dugald Clerk 889
Cooling and Purifying Producer Gases—Tweedale, E. & S., and Smalley, J. . . . 889
Purifying the Gas of Gas-Producers—Capitaine, E. 889
Discharging Machine for Gas-Retorts—West, J. 889
Internal Combustion Engine Working with a Two-Stroke Cycle—Albertini, P. 890
Patent Notices 890

CORRESPONDENCE.

The Destruction of Mains by Electrolysis . 891
The New Procedure of the Patent Office . . 891

MISCELLANEOUS NEWS.

The Wellingborough New Gas-Works—Inauguration Proceedings Last Thursday . 891
Presentation to Mr. James Pye—Half-a-Century in Office. 893
Alliance and Dublin Consumers' Gas Company—Half-Yearly Report and Accounts . 893
Shrewsbury Gas Company 893
Torquay Gas Company 894
Halifax Corporation Gas Department—The Operations of the Tar Works. 894
Lewisham Borough Council and the South Suburban Gas Company—The Illuminating Power and Purity of the Gas 894

MISCELLANEOUS NEWS (*continued*)—

The Gas Question at Bishop's Stortford . . 894
The Brighton Gas Poisoning Case 895
Gas and Electricity at Ryde 895
Gas *v.* Electricity for Ormskirk Workhouse—Electricity Favoured by the Guardians. . 895
Notes from Scotland 896
Current Sales of Gas Products 897
Coal Trade Reports 898
Stock and Share List 902

PARAGRAPHS.

Utilization of Tar from Water Gas—Incomes from Water-Works 872
Test of Suction-Gas Plant and Engine . . 876
American Gas and Coke Making Processes . 883
Benzol as a Motor Fuel 884
Electricity *v.* Gas at Wakefield 895
Gas Companies' Dividends and Income-Tax—Gruesome Discovery at Bristol—Gas Explosions at Derby—Unprofitable Electric Lighting at Dartford—New Retorts at Southport—A German Gas-Engine Combination—Incandescent Gas Lighting in Bermondsey—Additional Capital for the Maidstone Gas Company—The Walshaw Dean Water-Works of the Halifax Corporation 899
Sale of Gas Shares—Antwerp Water-Works Company, Limited—New Water-Works for Warsop—Gas Charges at Dukinfield—Truro Water Supply—Reductions in Price—Unreliability of the Electric Light—Fires Caused by Electricity—Cheap Gas for Motive Power at Ossett 900
Curtailment of the Manchester Water Supply—Explosion at a Gas Manager's House—Oil Stove and Lamp Accidents—Settlement of the Dispute at Messrs. Graham, Morton, and Co.'s Works—The Parliamentary Powers of the Tees Valley Water Board—Lewes Gas Company 901

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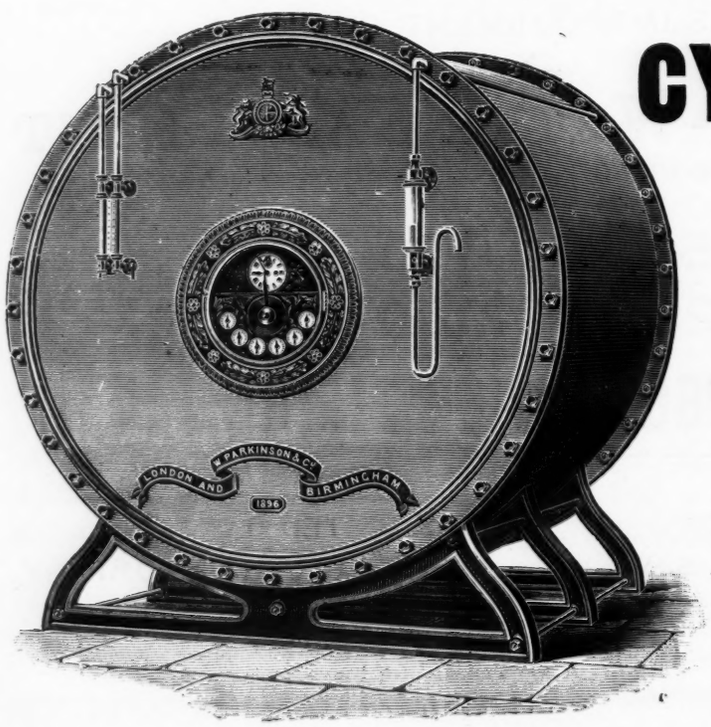

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EDITORIAL NOTES—GAS, &c.

Depreciation and Sinking Funds.

UNDER this heading, there was an article in a recent number of the "Municipal Journal" from the pen of Mr. L. N. Williams, of the Pontypridd District Council, in which is discussed the question of depreciation in relation to sinking funds. This is one which, at the present time, is greatly exercising the minds of municipal authorities, especially of those who find themselves in possession—no matter for the present purpose how or why—of trading enterprises the profit from which is more or less a doubtful quantity. These are finding comfort in the advice which is tendered to them that no further sums need be taken out of profits for depreciation so long as the capital outlay be repaid within the "life" of the plant or works which it represents. This view finds encouragement in the action of the Local Government Board and the Board of Trade, who, in sanctioning loans for public works, are supposed to pay regard to the "lives" of the subject for which such loans are needed. It is also endorsed by the declaration of the Institute of Municipal Treasurers and Accountants—more particularly with reference to electrical undertakings—that these "having to be maintained in "a full state of efficiency out of revenue, no depreciation, or "further writing-off of capital, is necessary when the period "allowed for the repayment of a loan is not greater than "thirty years, as the equated life of the works exceeded "this period."

Comforting though this doctrine may be to the struggling municipal trader, it can scarcely be regarded as entirely satisfactory from a practical standpoint, nor is it by any means the generally accepted view of the more fortunate municipalities, whose trading ventures are in a flourishing condition, and consequently well able to bear the cost of depreciation, in addition to that of repayment of loans. The Corporation of Glasgow, for example, are referred to in the article as proceeding on the lines that the sinking fund has no necessary connection with the life of its subject, and that it is right and prudent to depreciate, as well as to repay the loan. Thus the capital outlay upon the gas undertaking has been largely written down by means of surplus profits; so that to-day it stands at a very moderate figure, notwithstanding the recent large additional expenditure upon the new Provan works; while in the same number of the "Municipal Journal" there is the statement of accounts of the electricity undertaking for the past year, showing that depreciation to the extent of £32,181 was written off in that period. It is evident, however, that excessive depreciation, added to sinking-fund contributions, may unduly burden present consumers for the benefit of posterity.

At the same time, there is much to be said in favour of the view which regards depreciation as a separate matter altogether from the repayment of loans. To take, for example, the case of a loan required for the purchase of a gas or water undertaking. The amount of this has to be determined by reference to the maintainable profit earned by the undertaking. This maintainable profit is only arrived at after deducting a sum sufficient, according to experience, not only to maintain the works and plant in proper and efficient working order, but also to renew the same as they become worn out. Under these circumstances, it is difficult to see why the period for the repayment of the loan should be in any way dependent on the presumed "life" of the subject for which the loan is required. Nor is it, as a matter of fact. The term for repayment is not affected by the condition of the works to be purchased. Moreover, for water-works a longer period for repayment is generally allowed than for gas-works, on the ground of the greater permanence of such undertakings. During recent years, there has been a considerable reduction in the period allowed for the repayment of gas loans, owing probably to an uncertainty which at one time existed as to the future of gas lighting, exposed to the competition of the electric light. There seems, however, to be now no reason why the term should not be again extended—at any rate to (say) 50 or 60 years—seeing that formerly, a term of 80 years was not unknown. Nor can there be any necessity for a shorter term being imposed in the case of extensions, with the object of merely covering the "life" of the works to be provided. It is the permanence or otherwise of the undertaking as a whole that ought to be considered, and not simply the durability of this or that piece of plant; for this implies loans for renewals.

Renewals of all kinds, however, should be a direct charge against revenue, and be undertaken at the instance of the management. They should not be made the subject of fresh loans at the pleasure of the Local Government or any other Board, for no undertaking of this nature can be expected to thrive in such leading-strings as this would mean. It follows, however, that depreciation in some form or other is not only desirable, but necessary, independently of the length of term for the repayment of the loan; but the amount so expended in any shape need not, and certainly ought not to, be so large as to unduly burden the present generation. It should, however, sufficiently provide not only for renewals as they fall due, but also for very possible contingency of plant or machinery becoming out of date or obsolete; for no undertaking—whether gas or electricity—can now afford to fall behind in methods or appliances. For gas undertakings (with which we are chiefly concerned in this connection), it is sound policy—applicable to companies as well as to corporations—to charge the cost of all retort-house machinery, and all moveable machinery, plant, and appliances, to revenue, writing this down gradually through the stock-book until it has reached a nominal sum. In most cases, the additional profit derived from such machinery, &c., enables this to be done without increasing the cost of manufacture; and the undertaking is placed in a position to take advantage, without loss, of any improvement in machinery, or alterations in methods of manufacture, that may from time to time be introduced.

Eastern Counties Association Meeting.

THE circumstance of Mr. J. Stewart Dougall, the Manager of the Boston Gas Company, being President for the year of the Eastern Counties Gas Managers' Association, took the members to that ancient borough on Thursday for the second time within two-and-a-half years; and, notwithstanding the comparative contiguity of the two visits, the Chairman of the Company (Mr. William Pooles) and his colleagues again did the honours of the occasion with right good spirit and heartiness. In technical promise, if the Presidential Address be excepted, the programme did not compare with several that had preceded it; and therefore, it must be counted as another evidence (if such were needed) of the great popularity of the new head of the Association among his fellows that the attendance at the meeting reached a large figure. Ostentation is not one of the traits of the Dougall family; indefatigability in administrative work is one. Such work requires tact, ability, and application; and it goes far in ensuring the success of an organization of men. That is the direction in which the present head of the Eastern Counties Association, though he is numbered among the younger members, has brought upon himself the present honourable recognition of his worth.

The lines of the address with which the President inaugurated his year of office are in unison with the characteristic referred to. It is the composition of the thinker, of the student of current events and approaching certainties and possibilities. It shows that the commercial opportunities of the day in the gas business have in the President a master; while, on the other hand, there is the keen appreciation of what is further needed to keep the ball of the gas industry rolling in the path of progress—that is to say, towards cheap production and sale of gas. On the side of those who advocate the adoption of all means to secure what the customer needs, Mr. Dougall unreservedly ranges himself; and he unhesitatingly and unstintingly accords honour where honour is due for persistence in laying the foundation for,

and spreading effectively abroad the doctrine of, cheap gas for the people and for industrial use. He also sees that the road to cheaper gas is not only by the reduction of illuminating power, but by realizing more from the raw material; and he proclaims the faith that is within him, when he states that "the possibilities of carbonization are not yet "exhausted." There are directions, too, in which Mr. Dougall finds that the popularity of gas would be further enhanced by the production of reliable appliances ancillary to those by and through which gas is now consumed. This appreciation of an address of varied matter distinctly indicates that those who heard it were treated to a broad survey of the topics which are at present uppermost in the minds of the gas profession.

The maiden effort of Mr. F. Paternoster, the Manager of the Felixstowe Gas Company, in preparing a paper for an Association meeting was not by any means a disappointing one. It was composed entirely of experiences connected with the supply of that small, but fast-increasing, seaside resort. One or two of the members were inclined to be facetious over the title of "A Few Difficulties Associated "with the Supply of Gas to a Rapidly Increasing District." They saw in the work incidental to the present prosperity at Felixstowe something that was rather more pleasant than difficult. But if they had associated the title more with the position which Mr. Paternoster had to set himself to surmount when he was first entrusted with the charge of the concern than with the position which he has since helped to create, they would have seen a greater justification for the title. We need not traverse the contents of the paper; but this mention of it cannot be left without congratulating the author upon the results of his conscientious and constant endeavours for the Company he serves. Like many of its predecessors, the Boston meeting combined profit and enjoyment, to all of which the President and the Gas Company contributed largely.

The Earl's Court Exhibition.

In the course of the proceedings at the Eastern Counties Association meeting, references were made to the forthcoming International Gas Exhibition at Earl's Court. Both in the President's Address and in remarks by the ex-President (Mr. J. H. Troughton), the members were invoked to do all in their power to strengthen the hands of the Council of the Institution of Gas Engineers in connection with the exhibition by personal influence in respect of funds, and in securing the attendance of all interested, including as many consumers as possible, at the exhibition. Newmarket may be taken as an example of what to do and how to do it. It appears from what Mr. Troughton says (by the way, this is a matter to which our attention has not been specially drawn officially, so that we have not been able to editorially assist in giving it publicity before) that cheap tickets affording admission to the exhibition can be obtained for distribution by gas undertakings, and that—this is the point—only for those that are used will the undertakings be required to pay. The Newmarket Gas Company are sending out two of these tickets to every householder. Not many may take advantage of the suggestion, which these tickets will convey, that the recipients should visit the exhibition; but from those who do, the Gas Company may expect to gain benefit which will greatly outweigh the inconsiderable outlay involved. The Eastern Counties Association agreed, unlike the Manchester Institution, without hesitation to pay a visit as an organization to the exhibition on a day to be fixed in November. This is in response to the suggestion in the circular-letter addressed to the various District Associations by the Hon. Secretary of the Institution (Mr. J. W. Helps). The letter seems to have caused some misunderstanding. It is imagined by many that the proposal is that formal meetings should be held by the Associations; and this, it is clear, is not what is wanted by the gas engineers from the Provinces. And, of course, that is not the suggestion. It is simply that the Associations should organize from their own districts a visit to the exhibition by their members; and there is no reason why Chairmen and Directors and Committeemen should not also be included. This is simply one way of ensuring, as far as possible, that the gas profession and those having the control of gas undertakings throughout the country shall visit Earl's Court, and see for themselves the best that the gas industry can show in gas apparatus, appliances, and plant.

At one time, there was a suggestion that there should be conferences for technical discussion in the course of the exhibition. Whether anything further has been done in this matter is not known; but it is palpable that such conferences would not receive any great patronage from the Provinces. There is a feeling—and a very general one outside London and the southern districts—that the journey to London and back and the exhibition itself will absorb all the time that numerous gas engineers can hope to spare for the purpose at the end of November and the weeks of December during which the exhibition will be open. The season is not an appropriate one for any lengthy absence from home and duties; and it is widely considered that there are abundant opportunities for conference on gas matters at other and more convenient seasons of the year, and when there are not present the engaging attractions of a large exhibition.

Another suggestion has been privately mooted—we do not know that it has reached a point at which any official communication has been made on the matter—that it would be a great convenience if arrangements could be made at the exhibition for a kind of exhibitors' "club." Some provision must be made for refreshment purposes at Earl's Court; and it is thought that this might be combined with a reading and writing room. The exhibition will keep many of the principals of firms in London, and away from their ordinary business routine, for an unusual length of time; and Earl's Court will have a greater allurement if there are conveniences provided for them where they can look after their business communications and engagements. If the necessary room is placed at their disposal, there is little doubt that they will gladly avail themselves of it, and make all other necessary arrangements. It is a pleasure to mention the matter, in order to assist in giving a lead in its publicity; but those who originated the idea must follow it up if they still consider it a practicable one.

A Question of Public Safety.

The fresh case of gas poisoning at Brighton has once again called attention to the question of the supply of carburetted water gas admixed with ordinary coal gas, and its relation to public safety. This is the fifth similar occurrence since the Company commenced the distribution of the mixed gas; and while Dr. Newsholme, the Medical Officer of Health, persistently continues to keep before the eyes of the people of Brighton the fact that the admixture contains a greater percentage of poisonous property than coal gas alone, the Company cannot be particularly easy in their minds as to the future of their carburetted water-gas plant. There are considerations, however, of which apparently Dr. Newsholme does not take account. We do not point them out as a defence of the policy of supplying carburetted water gas, but as matters which should not, in justice to the Company, be lost sight of. Dr. Newsholme considers, in connection with these melancholy occurrences, Brighton and Brighton alone; and he may justify his attitude by saying that, as Brighton pays for his services, it is for him to do his utmost to serve its interests. If this be so, then we will suggest a more effectual way than the one he has adopted in this matter.

It does not appear to have crossed the Doctor's mind as passing strange that these deaths from gas poisoning are heard of somewhat frequently in towns where there is a large incursion of visitors, and that also frequently—we refer to other places, and not specially to Brighton—these accidental deaths take place in lodging and boarding houses where people only go for temporary residence. This fact suggests that it is to these places rather than to the Gas Company that Dr. Newsholme should turn a part of his assiduous attentions. It is now quite an old platitude that gas is made and distributed for lighting and heating and not for inhalation; and if the gas is kept in its proper channels by sound fittings, there would be no trouble from gas poisoning, unless the poisoning be either designedly or carelessly occasioned. The owners or keepers of boarding and lodging houses are in most cases far more culpable for the defective character of their gas-fittings than the company or authority who happen to be supplying the gas; and it does seem to us that, if there was a proper periodical inspection of the gas-fittings of houses let for the temporary residence of visitors (who when on holiday bent do not always exercise their usual care), less would be heard of these deplorable—but, we are thankful to

say, only occasional—cases of gas poisoning. With defective fittings, whether the gas be an admixture of two gases or a supply of pure coal gas, the chances are that the results would be the same in the event of a leakage during the night in a bedroom. In this latest of the Brighton gas tragedies, it seems abundantly clear that the lives of the aged couple named Hill, who were visitors to Brighton, were ended solely through the crude method that had been adopted at some time (whether still in actual use is not plain) for supplying gas to a stove through an india-rubber pipe served from a tap fixed immediately underneath the burner of a gas-bracket. How that tap became opened on this occasion, no one will perhaps ever know; but there is no reason to think otherwise (seeing that a jet of gas was kept burning above) than that, if the second tap had not had such close relationship with the lighting burner, Mr. and Mrs. Hill would still be living. There is no question that such an ill-conceived position for this second tap and such a dangerous method of feeding a fire ought not to be allowed in a bed-room that is occupied by a succession of strangers, any more than Dr. Newsholme would permit a house to be used for lodging purposes that was in a foul, insanitary condition.

We are not minimizing the fact that a gas containing 14 per cent. of carbon monoxide (as it was admitted the Brighton admixture does) is more dangerous, *if it escapes*, than one containing half that quantity. Our point is that, no matter whether the percentage of carbon monoxide in a gas be great or small, the blame for the majority of these fatal poisonings rests more with defective or ill-designed fittings than with the gas itself. There are places besides Brighton where 14 per cent. of carbon monoxide is found in the mixture of gases distributed, but where a fatal gas-poisoning case is never heard of. In view of this and the recent occurrence, Dr. Newsholme might do worse than direct his attention to seeing whether the gas-fittings of all places in Brighton used for temporary lodging or residence cannot be brought under some kind of systematic supervision, in order to protect those upon whom the prosperity of the "Queen of Watering Places" so largely depends.

At the same time, voluntary moderation is better than compulsory; and if the suppliers of carburetted water gas desire to continue its use untrammelled by legislation, they will practise this. Some little time since, an engineer with large experience in the supply of carburetted water gas published an analysis of a mixture of unpurified coal gas and carburetted water gas (35 per cent. of the latter); and this contained 13·8 per cent. of carbon monoxide. This gives an indication as to the percentage of carburetted water gas in the Brighton supply as distributed, which contained 14 per cent. of carbon monoxide. In another column to-day, there is an epitome of the regulations that have been applied to the Matlock and District Gas Company in connection with their proposal, if the demand arises, to take up the supply of power gas in their district; and the regulations are similar to those that have been applied to large power-gas companies. A penalty attaches to the supply by the Company of power gas containing more than 14 per cent. of carbon monoxide; and they are not to be allowed to supply the gas for use in private dwelling-houses, though it is to have "a distinctive and readily perceptible smell." In view of this condition as to the distinctive smell, the stringency of the limitation regarding carbon monoxide may be uncalled for; but it undoubtedly puts a weapon in the hands of Medical Officers and others who are hostile to the supply of carburetted water gas. While we prefer freedom for the gas industry in every way, the eyes and ears cannot be closed to warnings. And if public clamour is aroused again, further resistance to restriction regarding the percentage of carbon monoxide in distributed gas may not be successful—notwithstanding the arguments advanced in dealing particularly with the latest of Brighton fatalities.

Mr. Hawtayne and the Check on Municipal Imprudence.

It is natural that Mr. Hawtayne should feel keenly incensed over the severe and humiliating rebuff that his Wood Green electric lighting scheme (referred to in last week's "Electric Lighting Memoranda") has received at the hands of the Local Government Board, and that he should look round for someone upon whom to vent his anger. He cannot very well "go for" the Local Government Board, for that is a body without a soul to be vexed, and it would be impolitic for anyone having dealings with the Board to openly question the wisdom of a decision of theirs, no matter how profoundly that one may privately entertain the opinion that in this matter, as in many others, their verdict is the height of folly or the result of some mental disorder. In this particular case, however, we are of those who regard as sound the Board's determination not to allow the Wood Green District Council to enter upon a scheme which is financially doubtful, and founded upon estimates of financial probability which Mr. Hawtayne did not scruple to lightly change to meet the views of the Inspector of the Board—so the Board themselves said in the letter to the District Council noticed last week. The "Electrician's" opinion on this subject coincided with our own; and as that was the only electrical paper which gave special attention to the matter, and applauded the action of the Local Government Board, Mr. Hawtayne has ventured to question some of its statements which only hinge on the main question—fighting shy altogether of the very grave condemnation contained in the letter of the Board. That would have been a more interesting topic upon which to have heard Mr. Hawtayne's views. But that gentleman, in his attack on the "Electrician," does little more than fall into the error (which is unfortunately a too common one with electricians, and against which our contemporary has strongly protested) of referring to the generating costs of undertakings of a totally different order from anything that may ever be expected to exist in Wood Green. He takes for examples Hackney and Stepney, which have nothing in common with Wood Green, and number their lamp connections by the thousands—Hackney by 90,000 eight-candle power lamps, and Stepney by 76,000; while the most generous prediction that Mr. Hawtayne dares to make for Wood Green is 19,800 lamps.

The Example of Erith.

It would have been more to the point if Mr. Hawtayne had referred to Erith, although that is, according to those capable of making the comparison, a far more favourable district for electricity supply than Wood Green. There is also some appropriateness about Erith, because it happens to be one of Mr. Hawtayne's own progeny; and it ended its last financial year with a deficit of £781. But though the undertaking is not in a position yet to make the income cover the outgoings, the Council are now involved in more capital expenditure on extensions, which will mean a further addition to interest and sinking-fund charges. However, the Wood Green job is quite sufficient for the Engineer to have in hand at one time, without wearying himself about the troubles of other concerns in which he may have been intimately interested in the past. What the upshot of the Wood Green business will be, readers of the "JOURNAL" will be curious to see. If it has the two effects of causing electrical engineers to be more cautious in future over what they put before local authorities, ratepayers, and the Local Government Board, and of restraining municipal speculators, it will be something to be thankful for. Meanwhile, it may be noted that, on the Maidstone electricity undertaking last year, there was a deficit of £1275; and Morley only earned a gross profit of £831, so that the department must be substantially short, after discharging the claims of interest and sinking fund.

In Favour of High-Pressure Distribution.

The inclusion, in the programme of the last annual meeting of the Institution of Gas Engineers, of a paper by Professor Unwin dealing with the subject of the distribution of gas at high pressure, was a significant event. It was a recognition by the governing body of the organization representing the gas industry, of the changed conditions under which the staple of the industry is supplied now compared with only a comparatively few years ago. The largely extended use of gas for culinary, heating, and motive power purposes has necessitated a considerable increase in the pressure at which gas is delivered, in order that the requirements of the consumers may be fully met; and the problem of maintaining and even exceeding the results already achieved has engaged the attention of some of the most thoughtful and resourceful of gas engineers. Prominent among them stands Mr. F. H. Shelton, of Philadelphia, whose paper at the International Gas Congress in Paris four years ago brought under the notice of his European colleagues the various successful examples of gas distribution at high pressure (some carried out under his personal supervision)

to be found in the United States. While his communication aroused very considerable interest, it is due to England to say that we, on this side of the Atlantic, were not altogether strangers to the subject of it, as witness Mr. Trewby's interesting statement appended to the report of the discussion of Professor Unwin's paper already alluded to. Nor was it unknown in Germany. It is not, however, to discuss the general question of high-pressure distribution that it is referred to here, but merely to direct attention to a further contribution to its literature which appears in another part of the "JOURNAL" to-day. It is a paper read by Mr. E. Campbell Jones, the Chief Engineer of the Gas Department of the Californian Gas and Electric Corporation, before the Pacific Coast Gas Association, at their annual meeting in San Francisco a short time ago. Mr. Jones gives particulars in regard to the high-pressure gas supply in the towns of Grass Valley, Nevada City, and other places—one of the best examples being that of Fresno. To these, he added a *résumé* of his personal experience in connection with high-pressure distribution, in which he brought out a great deal of information which cannot but be valuable to all who are contemplating the introduction of a supply on this system. Some useful hints also came out during the discussion, a summary of which is appended to the paper. Altogether, the feeling of the meeting was with the author, who did not fail to emphasize the value of gas-engines as sources of motive power in connection with the system of distribution dealt with. Both paper and discussion may be commended to the notice of our readers as throwing some additional light upon a question which the Past-President of the Institution of Gas Engineers does not hesitate to class among the "pressing" ones of the present time.

The South Suburban Company and the Local Authorities.

Though it was hoped a way would have been found for avoiding it, in order to give the matter a fair trial, the expected result has come to pass of the determination of Sir George Livesey and his colleagues of the South Suburban Gas Company to cease lime purification at the works and the enrichment of the gas by carburetted water gas. The Lewisham Borough Council have resolved to take proceedings against the Company in respect of a deficiency of 0·82 candle in the statutory illuminating power of 15 candles, and for an excess of sulphur per 100 cubic feet—the total being 34·51 grains—on Aug. 30. The matter is now in a position in which it would be improper to comment on it. It is stated, however, that the Committee who recommended that action should be taken were not altogether unanimous; and there are among the councillors those who sympathize with the Company. This instance of the gas not conforming with the standard is not an isolated one, but is said to be the only official ground the Council have to go upon. It will be remembered that it was the Lewisham Council who were responsible for the actions for nuisance to which the Company were subjected, and in which the Magistrate refused to convict on the ground that the nuisances were unavoidable by the Company in complying with their statutory requirements. In connection with this revival of litigation, the Committee urge that "there does not appear to be any ground whatever for permitting the Company to supply gas of less power and purity than that required by statute, or permitting them to break the law in the manner in which they indicate their intention to do." Until the matter was brought before the Council last Wednesday, consumers of gas in the district were not aware that the Company had commenced to "break the law," either in respect of the illuminating power or the purity. Therefore, they have not been one penny the worse, but one penny per 1000 cubic feet the better off.

Progress and Prosperity at Shrewsbury.

If any justification were required for the important step taken by the Directors of the Shrewsbury Gas Company in carrying out the large extensions—amounting practically to the erection of new works—which were described and illustrated in the "JOURNAL" towards the close of last year, it would be found in the report presented at the annual meeting last Wednesday, as given in another column. There was an increase of 10½ million cubic feet in the consumption of gas during the year ending the 30th of June; and the profit realized amounted to £8182. This allowed of the payment of the authorized dividend, with a carry forward of £1563. A sum of £800 was set aside to meet the depreciation in Consols, in which the reserve fund, amounting to £8631, is invested. Three factors, as Mr. Beacall, the Deputy-Chairman (who presided in the absence of Mr. Spencer Phillips, the Chairman), said, had conduced to the Company's prosperity—increased consumption, improved working, and favourable coal contracts; and for the second factor credit must assuredly be given to Mr. W. Belton, the Company's Engineer, Secretary, and Manager, and to the new works carried out under his direction by Messrs. R. Dempster and Sons, Limited, which it is satisfactory to find have "fully realized the expectations formed of them." While 4·38 per cent. more coal was carbonized, 5·49 per cent. more gas was made; and there was an increase to the extent of 6·53 per cent. in the quantity sold. The unaccounted-for gas was reduced from 5·78 to 4·7 per cent.; and there was a decrease in wages and other items. All these things justified the Chairman in characterizing the year as one of the most prosperous in the history of the undertaking. This prosperity has been shared by the consumers in the shape of a reduction of 2d. per 1000 cubic feet in the price of gas as from the 30th of June. As Mr. Belton pointed out, in acknowledging a heartily-accorded vote of thanks for his services to the Company, which have extended over a period of 25 years, the more the Directors can do in this way, the more the prosperity of the concern is likely to increase. That it will increase, and that largely, under the present management, we do not for a moment doubt.

The Lighting and Extinguishing of Street-Lamps.

Those responsible for the lighting and extinguishing of street gas-lamps are generally agreed that there is something crude and uneconomical in the system which calls for the visit of a man twice a day to every street lamp-post, to say nothing of the occasional visits in addition for lantern cleaning and mantle replacements. In this matter of lighting and extinguishing, the electric lamp is undoubtedly the superior of the gas-lamp; but, though this is conceded, it must be held that it is the only point in which the former does excel. If suddenly a light is required in the public ways, through any abnormal condition of the atmosphere, from one central station a whole district in which there are electric lamps can be immediately illuminated; but not so with gas-lamps. The cumbersome method of having to despatch men armed with torches has to be resorted to, and with the consequent delay. But even this sole advantage of the electric light over gas is superable by those responsible for its supply, if they only care to face the first expense of automatic appliances, and meet it by subsequent savings. Several arrangements have been placed on the market for the purpose; but the extent of the favour accorded to them in this country has been very limited. Only as recently as June last, we described the system of Westenholz for lighting and extinguishing public lamps; and since then (on Aug. 23) an account was published of the automatic system which is being introduced by Messrs. A. & E. Cohen for dealing with the lights of large establishments. The subject is a live one on the Continent just now; and the reference of the President of the Eastern Counties Gas Managers' Association to it in his address on Thursday is likely to awaken further interest in it in this country. He recognizes that it is "a waste of energy and money to be obliged to send to each lamp at the time of lighting and extinguishing;" but he puts his finger on the right spot when he says that "unless the apparatus is thoroughly reliable, the consequences might be serious." Reliability is what inventors have been working for; and experiences with the latest types of apparatus seem to disperse doubt on this score. Curiously enough, while the subject was being mentioned at Boston, we had under test the apparatus which Dr. Rostin, of Berlin, has invented for lighting and extinguishing lamps by increasing, for both objects, the pressure at the gas-works to a point—slightly or with a good margin as preferred—above the maximum pressure given in the district for ordinary purposes. The arrangement has been cleverly designed; and it answered admirably all the tests applied to it here. It is described in another part of this issue.

Mr. Charles Wilson, the Manager of the Tudhoe Gas-Works, died last Tuesday, after a short illness. Deceased, who was 40 years of age, was Colour-Sergeant in the local Volunteer corps, and as a marksman often carried off the best prizes.

THE MERITS OF CARBURETTED WATER GAS.

It is much to be hoped that the time which has elapsed since the publication of the now famous letter from the Crystal Palace District (now South Suburban) Gas Company to their consumers, has sufficed to allay the feeling which it undoubtedly aroused among users elsewhere of carburetted water gas, and that the merits or demerits of the latter may be discussed without personalities. These, in a matter of this kind, are a sign, not of strength, but of weakness.

The discussion so far has been meagre, and may almost be said to have been practically confined to the letter from Mr. A. M. Paddon, which appeared in the "Journal" for the 6th inst. This was a well-reasoned, if not altogether convincing, defence of carburetted water gas from the standpoint of one who is an engineer and advocate combined, though one must confess to seeing in it more of the advocate than of the engineer. Mr. Paddon's appeal to the effectiveness of incandescent street lighting where a mixture of coal and carburetted water gas is used, only asserts what no one will dispute—namely, that a good effect can be obtained with such a mixture, if accompanied by suitable regulation of the air supply. Where the trouble comes in is in the want of uniformity in the mixture; the proportion of carburetted water gas being liable to vary almost from day to day, while it is next to impossible to correspondingly regulate the air supply. Moreover, as regards economical effect, the only thing which is established beyond all doubt is that in calorific value carburetted water gas is inferior to coal gas; and consequently no mixture of the two is, or can be, equal in this respect to coal gas alone. This is a matter of considerable importance to users of gas for heating or power purposes, and discounts to an extent any claim to relative cheapness that carburetted water gas may possess.

Mr. Paddon also lays considerable—and, it would seem, undue—stress upon the probable influence of the manufacture of this gas upon the price of coal and the returns obtainable for coke and other residuals. We say "probable," because, though individual relief may have resulted from the withdrawal from the market of a portion of the production of gas coke, and a better price for the remainder may have been for a time obtained, it is not by any means clear that such advantage is a permanent one. It is only by a comparison of prices that have ruled for coal and coke over a sufficiently long period that any definite conclusion can be arrived at on this point. Such a comparison is necessary, because the value of gas coke is, in the long run, governed to a great extent, though not absolutely, by that of coal, the downward tendency of which during the present year threatens to make—if it has not already made—practically impossible the prices for gas coke quoted by Mr. Paddon. A reduction, too, of the available supply of the one kind of fuel inevitably causes an increased consumption of the other. This, it is true, may be more than counterbalanced by the substitution of oil for coal; but it can hardly be correct to assume, as Mr. Paddon appears to do, that such substitution has materially (if at all) affected the price of the latter.

Mr. Paddon estimates the present annual production of carburetted water gas as being equivalent to about 2 million tons of coal. This, on the annual production of coal within the United Kingdom (which, according to the Board of Trade returns for 1903, amounted to fully 230 million tons), is less than 1 per cent.—a proportion so small as to be practically inappreciable. Gas coal is not a thing apart; its price is entirely regulated by the general condition of trade for the time being. When trade is good, gas coal is correspondingly scarce and dear, and *vice versâ*. This year, for example (when there is a general complaint of bad trade), for every ton of gas coal required in the Midlands, it is no exaggeration to say that from 5 to 10 tons were offered, and at lower prices than have ruled for several years past. Making all allowance for the same coal being offered several times over, it is certain that the supply is greatly in excess of the demand, although the latter is constantly increasing. What, then, is to be said of Mr. Paddon's view, which he seems to regard as incontrovertible, founded on the great rise of price in 1900, that our coal account is "heavily overdrawn"? There have, it is needless to say, been other instances of a temporary rise in the price of coal besides that of 1900—notably that of 1872-3, when coal rose to prices that have not since been approached. Pessimists at that time talked of our coal account being heavily overdrawn, in much the same way as Mr. Paddon talks now, though the consumption of gas coal could not then have been very much more than one-third—certainly not more than one-half—of what it is now. Of the effect of the manufacture of carburetted water gas upon the values of tar and ammoniacal liquor, it need only be said that, to any one acquainted with the subject, it must appear that the introduction of coke recovery ovens on the Continent has depressed these values to a far greater extent than any limitation of the production of coal gas can have tended to raise them.

On the important question of cost of production, Mr. Paddon is content to say that "an analysis of the accounts of those who have used, and are now using, carburetted water gas, shows that, in very many such cases, carburetted water gas, irrespective of the higher illuminating power necessary to effect all desired enrichment, is cheaper, by itself, than the coal gas it enriches." Is it not equally safe to say that, with the present price of oil, coal gas is, in some places, cheaper to make than carburetted water gas, the use of which has consequently been temporarily discontinued? Much depends upon the cost of making coal gas, which, again, depends largely upon the amount of attention bestowed upon it. Where such attention is undivided, and care is taken to keep well abreast of modern progress, carburetted water gas can have at best only a very precarious and uncertain footing.

On the broad question of economical advantage, however, Mr. Paddon has essayed no reply to the question which was put in the article on the subject in the "Journal" for July 26 last—namely, "Can the figures in 'Field's Analysis' be made to prove that a gas undertaking which has manufactured both coal and carburetted water gas for the past seven or eight years has thereby improved its position?" We do not think that they can, but, of course, we are open to conviction on the point. What we should now like to see is a comparison of average working costs before and since the introduction of carburetted water gas. For example, the Tottenham and Edmonton Gas Company adopted this gas in 1894. What were their average working costs for coal, less residuals, purifying, and wages respectively, during the ten years from 1894 to 1903 inclusive, and how do these compare with similar averages for the previous ten years? The Company, as everybody knows, make an exceptionally large proportion of carburetted water gas; and, therefore, any advantage derived from its manufacture ought to be apparent there if anywhere.

Mr. A. E. Broadberry did, indeed, claim, in his letter which appeared in the "Journal" for Aug. 2, a considerable improvement in capital outlay as the result of the "Tottenham policy." But his method of doing so was a little unfortunate for the side which he supports. He took for the starting-point of his comparison the end of the year 1894, and showed that since that time to the end of 1903 the capital employed by his Company was reduced from 12s. 9d. to 10s. 2d. per 1000 cubic feet sold. Seeing, however, that the water-gas plant was provided and brought into use in 1894, the starting-point for his comparison should have been the end of 1893—before, presumably, any expenditure on the plant had been incurred. At that time the capital account stood at 12s. 2d. per 1000 cubic feet sold, or 7d. less than at the end of the following year. Comparing this figure of 12s. 2d. with the one for 1903, which is 10s. 2d., a reduction of 2s. during the ten years is shown. This is substantial, though by no means a notable record, especially having regard to the great advantages which the Company enjoyed by reason of the extraordinary expansion of their business during the period—which amounted to no less than 164 per cent.

There are but few companies who can record such an increase as this; and a gas undertaking must to a certain extent be judged by its opportunities. Comparing, however, this Company with themselves, "Field's Analysis" shows their capital employed at the end of 1883 as 14s. 4d. per 1000 cubic feet sold. This at the end of 1893 had been reduced to 12s. 2d.; so that during the ten years prior to the adoption of water gas the capital account was reduced by 2s. 2d., as against 2s. during the ten years of its manufacture, and notwithstanding the exceptionally large expenditure during the later period under the head of repairs and maintenance, to which Mr. Broadberry drew attention in his letter. This does not look as though any advantage had been gained by the Company in capital outlay through the adoption of carburetted water gas; but there may be an explanation. These are among the thoughts suggested by what has already been said on this important subject, further contributions to the discussion of which will be gladly welcomed.

A GAS COMPANY AND POWER-GAS SUPPLY.

The Matlock and District Gas Act.

In another column is commenced the publication of our summary of the provisions of the Acts for the past session. From it, we have removed the notice of the Act of the Matlock and District Gas Company, in view of the considerable and interesting powers conferred upon the newly incorporated concern, and notably those referring to the supply of power gas.

The capital of the Company is to be £92,000, consisting of £46,452 7s. 6d. original capital, and £45,547 12s. 6d. additional capital. The standard rate of dividend is 5 per cent.; and so every person holding, before the passing of the Act, shares bearing 10 per cent. dividend will receive two shares for every one, and every person holding shares bearing 7 per cent. dividend will receive for every five shares seven shares in the capital of the incorporated Company. The standard price to be charged for gas is 4s. per 1000 cubic feet; and, with reductions or increases of 1d. in the price, the dividends are to be increased or decreased in respect of any half year by 1s. 3d. per cent. The Company are authorized to charge an additional 6d. per 1000 cubic feet in Winster; but this is not to have effect for the purposes of fixing the amount payable as dividend. Discounts for gas supplied for illuminating power purposes are not to exceed 20 per cent. An excess of 10d. is allowed on the ordinary price of gas for prepayment meter supplies (including meter and fittings); and for a meter alone, 10 per cent. on its cost. Provision is made, on the issue of stock or shares forming part of the additional capital, for their being first offered to the consumers

and employees of the Company, on what are now the well-recognized conditions. In respect of the original capital, the Company are authorized to borrow £8711, including £6450 already borrowed; and in respect of the additional capital, one-third. It is also specifically provided that the Secretary of the Company (Mr. Robert Hall) shall not, by reason of his occupying that position, be disqualified from being a Director of the Company. The Company have powers of compulsory purchase of certain scheduled lands, and, by agreement, a further 5 acres. For the purposes of conveying the material to and from the gas-works, a tramroad of 4 ft. 8½ in. gauge is authorized from the Derby to Manchester main line of the Midland Railway to the works. It is enacted that the tramway is to be used solely for the purposes of the Company, and that the trucks or carriages are to be "moved by animal power, or by means of a winding engine and rope." If not exercised within five years, these powers will lapse. The hours within which the tramway maybe used across the main road from Bakewell to Matlock Bridge are also regulated. The quality of the coal gas to be supplied by the Company for illuminating purposes is to be 15 candles, but "power gas need not be of any illuminating quality." The London 16-candle argand is prescribed for testing the coal gas; and, in making the tests, the gas is to be burned "at such rate as to yield the maximum light for which the burner shall have been designed, and the gas shall be burning for at least half an hour before any test shall be commenced."

The Company, it is seen by the foregoing, are authorized to supply power gas; and this brings us to one of the, in interest, paramount features of the Act. For this purpose, the Company are authorized to expend out of the additional capital a sum not exceeding £15,000. There is an obligation on them to supply premises situate within 100 yards of any power-gas main, if required by the owner or occupier. If so disposed, they may require a contract from the consumer to take not less than a million cubic feet of the gas per six months, and to continue to receive and pay for a supply for a period of at least two years, but they are not to be compelled to supply power gas, unless the consumer is willing to contract for a supply of not less than a million cubic feet per year. The Company are not permitted to supply power gas in private dwellings. As to the quality of the power gas, it is stipulated that it shall not contain more than 14 per cent. of carbon monoxide, and that it must possess a distinctive and readily perceptible smell. For every contravention in these respects, the Company are to be liable, on summary conviction, to a fine not exceeding £50. The supply of power gas (which, by the way, must not be used for purposes of illumination) may be by a proportional meter. The Company are also to supply at their generating-stations, a place for the purpose of testing the thermal power of the gas and the presence of carbon monoxide; the appointment of a competent examiner resting with the Local Authority or two Justices. For deficiencies in thermal power, the penalty is to be a sum not exceeding £20. The minimum heating value is to be 125 British thermal units per cubic foot, at 32° Fahr. and 30 inches of mercury pressure; the produce of the combustion being cooled to 60° Fahr. The charges are to be as follows: For gas having a calorific power of 125 British thermal units 6d. per 1000 cubic feet; and for gas having a higher calorific power, a further 1d. per 1000 cubic feet for each additional 25 thermal units. The Company are prohibited from supplying power gas in the part of their area within the Matlock Bath and Scarthin Nick urban district, unless with the previous consent of the Council.

The Company have also obtained power to apply for a Provisional Order for the supply of electrical energy.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 902.)

THE week opened on the Stock Exchange with rather a steady tendency, as there was evidence of some investment buying; but a weaker tone subsequently prevailed—all markets giving way on unfavourable reports concerning the political situation in the Far East. Consols and other gilt-edged stocks were affected in spite of the ease in the Money Market; but these were also influenced by rumours regarding the flotation of fresh loans. Among others, a new Irish Land Loan is talked of; while a fresh issue of Exchequer bonds is looked for next month, as well as the Water Board stock. These constant borrowings are having a detrimental effect upon the Stock Exchange; for a large amount of stock has to be carried by underwriters, as the public has not the power to absorb all the issues judging from the revenue returns issued last week, which show a decrease of £1,100,000 in the income-tax collections between April 1 and Sept. 17 compared with the corresponding period of last year. The markets closed a little firmer on Saturday; Consols, after being as low as 88, leaving off at $88\frac{3}{16}$ for money and the account. Other departments were likewise steadier in sympathy; but dealings have been much restricted in view of the settlement. The Gas Market has shown firmness, though with the exception of Gaslight ordinary the dealings have not been numerous. This stock has been actively dealt in between $93\frac{1}{4}$ and $94\frac{3}{8}$; the rise recorded last week having brought some stock to the market, which was readily absorbed, for the price is unaltered, while the 3½ per cent. maximum rose 1, to 87-9. South Metropolitan likewise met with support; and the ordinary advanced 1, to 125-27. The Suburban group was quiet; the only alteration in prices was a rise of 1 in Brentford new, to 178-83. Some dealings, however, were recorded in Crystal Palace ordinary and Tottenham secured issues. As regards Provincial stocks, Liverpool United "A" has advanced 1; but the "B" stock is 2½ lower, at 156-58. In the Foreign group, Primitivas have been the most active; the ordinary advancing to $4\frac{3}{4}$-5¼ and the preference to $4\frac{1}{4}$ to $4\frac{3}{4}$. Considering the dulness existing in other sections of the Stock Exchange, the Gas Market has been very well supported.

The daily business, with the exception of that in Gaslight ordinary, was on a very moderate scale. On Monday, Gaslight ordinary was dealt in between $93\frac{3}{8}$ and $94\frac{3}{8}$, and maximum 3½ per cent. $87\frac{3}{4}$. South Metropolitan was in request, and rose 1, to 125-27. Tuesday again saw inactivity, though a little business was done in Gaslight ordinary at $94\frac{3}{8}$, South Metropolitan at $126\frac{3}{4}$, and the debentures at $87\frac{3}{4}$. Brentford new stock was advanced to 178-83, Cagliari 1, to 22-24, Buenos Ayres new ¼, to 11¼-11⅜, and River Plate ordinary ¼, to 11¼-11⅜. Wednesday was a very active day for Gaslight ordinary—considerable business being recorded between $93\frac{3}{4}$ and $94\frac{1}{4}$; while the 3½ per cent. maximum rose 1, to 87-89. There was also an advance in Primitiva ordinary, to $4\frac{1}{4}$-$4\frac{3}{4}$. Dealings were recorded in South Metropolitan at $125\frac{1}{2}$ and 126, Buenos Ayres at $11\frac{3}{8}$, Cape Town at $14\frac{3}{4}$, and Imperial Continental at $202\frac{1}{2}$ and $202\frac{1}{2}$. There was less doing in Gaslight ordinary on Thursday, though business was done at $93\frac{5}{8}$ up to $94\frac{1}{2}$. Crystal Palace ordinary marked $118\frac{3}{4}$, South Metropolitan 125, Tottenham debentures 106, Imperial Continental 202, while Primitiva rose ¼ to $4\frac{1}{2}$-5. On Friday, a large business was transacted in Gaslight ordinary between $93\frac{1}{4}$ and $94\frac{1}{4}$. South Metropolitan marked $126\frac{1}{2}$, Primitiva ordinary 5, ditto preference $4\frac{1}{2}$, Buenos Ayres $11\frac{7}{16}$, Imperial Continental 205. On Saturday, scarcely any business was recorded.

THE LEWES SELF-CARBURETTING PROCESS.

ATTENTION was directed a few weeks since in the "JOURNAL" to the contradictory character of the results obtained with this process by different engineers. In view of the uncertainty which thus naturally prevails as to the utility of self-carburetting, it seems desirable to quote the more significant portions of a correspondence bearing on the question which has lately occupied several columns of our German contemporary, the "Journal für Gasbeleuchtung."

Last June, there was published in the "JOURNAL"* an account of some trials in self-carburetting conducted at the St. Gall Gas-Works by Herren A. Albrecht and Shirk Boyer. Their conclusions, it will be remembered, were generally very unfavourable to the process. Thereupon, Herr Dicke, of the Dellwik-Fleischer Water-Gas Syndicate, and Herr Bueb, of the German Water-Gas Lighting Company, wrote to point out that Herr Borchardt, of Remscheid, Herr Croissant, of Ludwigshafen-on-Rhine, and Herr Kobbert, of Königsberg in Prussia, had earlier published results of trials of the process which, they said, did not agree with those obtained by Herren Albrecht and Boyer. It was suggested that the trials conducted by the latter were of too brief duration, and were of dubious value, because a single independent setting only was employed. Herren Dicke and Bueb further stated that they would be in a position to conduct extensive trials of the process this autumn in several large gas-works, and that the results should be published in due course. Long experience had shown that a number of structural details, with which Herren Albrecht and Boyer could not be familiar, were essential to the successful application of the Lewes self-carburetting process. Moreover, Herr Dicke had earlier pointed out that fluctuations in working which he had experienced were to be ascribed mainly to the setting being an independent one, with which it was very difficult to keep the temperature constant. It was thus impossible, in such a case, to say whether fluctuations in the composition, calorific value, or illuminating power of the gas were either due to self-carburetting or to the variable working of the setting. Hence the self-carburetting process should be investigated through operating on the scale of a large gas-works.

Herren Albrecht and Boyer have replied to these criticisms of their trial of the process. They give quotations from the reports of the trials at Remscheid, Ludwigshafen-on-Rhine, and Königsberg, with a view to disproving the statement that the results given in these reports were not in agreement with their own. Thus Herr Borchardt, writing in 1902 with reference to the Remscheid trials, said (to quote the "JOURNAL" rending of his words †): "Unfortunately, very much depends on the opening and shutting of the cocks by the works staff, as required at different intervals of time." The data given by him at that time were, say Herren Albrecht and Boyer, quite general; and thus the results could not be checked. Again, a few months later, when reporting on the working of the Remscheid gas undertaking, Herr Borchardt said, with reference to the self-carburetting trials: "A definite judgment on these trials cannot yet be pronounced; . . . . and further trials will show

* See "JOURNAL," Vol. LXXXVI., p. 956. † *Ibid.*, Vol. LXXX., p. 1623.

whether the self-carburetting of water gas is to be practised for long with advantage." The report of the Remscheid undertaking for the year ending March 31, 1903, does not, according to Herren Albrecht and Boyer, contain many figures which can be checked; and Herr Borchardt, as before, speaks chiefly of the possibility of adding 40 to 50 per cent. of water gas to the coal gas. There are, indeed, references to the quantity of benzol which has to be added, when water gas is introduced in the hydraulic main or the retorts, in order to produce a proper gas. But the report does not say what is to be understood by a proper gas, or the proportions of admixture, or the qualities of the component gases for a given addition of benzol, or how and where the gas is measured, or the time or duration of the addition of benzol to the distributed gas. In fact, Herr Borchardt does not appear to have reported his experiments as though he wished them to be considered conclusive or exhaustive. Hence, say Herren Albrecht and Boyer, his experiences can scarcely be said to be opposed to their own results.

The letter of Herren Albrecht and Boyer continues as follows: "Even Professor V. B. Lewes, the discoverer of the self-carburetting process which goes by his name, frankly admits the uncertainty as to the expediency of his process. In the course of the discussion on a paper read by Mr. Stephenson, of Tipton, in June, 1903,* he said: 'If you asked me at the present moment what I think of my own process, I could only reply that I have not the vaguest idea.' And again he said: 'But to say at that time that they had two rivals in the market—this possible Lewes process on the one hand, and the carburetted water-gas process on the other—was simply nonsense. They had had ten years of figures in regard to carburetted water gas and what it could do; and they knew all about it. They knew nothing whatever about this new process. It might be a thoroughly bad one.'"

Herr Croissant, the Manager of the gas-works at Ludwigshafen-on-Rhine, has, indeed, spoken† of a gain in heating value of 7 to 12 per cent.; but it appears that, as in results previously given by Professor Lewes, the increase in heating value obtained by the addition of water gas is referred to the ton of coal carbonized. An impartial technical man would form from Herr Croissant's paper a judgment somewhat as follows: Blue water gas may perhaps by sharp checking be added without disturbance to coal gas within certain narrow limits, provided the mixture is subsequently doctored by means of benzol to meet the tests for calorific and illuminating power. Proof that the application of this self-carburetting process is attended by a real and manifest advantage, is not afforded here. Moreover, Herr Croissant's writings will, he says, be searched in vain for figures which can be checked.

Herr Kobbert, the Manager of the gas-works at Königsberg, reported in May last that he had formed the following opinion, *inter alia*—viz., (1) That the so-called self-carburetting process protected under the German patent No. 130,112 can be practically applied only when the proportion of water gas shall not exceed 30 per cent. of the mixed gas, unless substantial alteration of the consumers' burners, &c., is made. (2) A gain in heat, in the sense of the patent, cannot be established under the conditions just specified as to the proportion of water gas. The claim of the patent only begins to be substantiated with a higher proportion. (3) The question whether 500 cubic feet of water gas, introduced by self-carburetting into 1000 cubic feet of coal gas, yield 1500 cubic feet of mixed gas, must be answered in the negative so far as these experiments, made with English coal, show. If the measured water gas is deducted from the measured mixed gas, the difference is less than the make per ton of coal carbonized, when self-carburetting stands in abeyance.

Herr Kobbert thus substantiates the conclusions of Herren Albrecht and Boyer; and the latter ask, in view of his results, what value there can be in the process. They proceed to point out that the foregoing quotations show opinions very different from those held by Herren Bueb and Dicke as to the advantages of self-carburetting. In regard to Herr Dicke's condemnation of the trials at St. Gall because an independent setting was used, they observe that a process which is to be technically applied must not be of so sensitive a character that a little loss more or less by radiation will cause such large fluctuations in the quality of the product, and such a poor product. Moreover, the conditions were comparable for the coal gas and the mixed gas; both being made in the independent setting.

In conclusion, Herren Albrecht and Boyer say that their trials at St. Gall in March and April last‡ were carried out with a retort-setting which had been previously used for a long time, so that it should have attained good and regular working order; and their results over a period of three days would not differ from those for a fortnight. In any case the utility of the Lewes self-carburetting process appears to have been at least put greatly in question, as no gain could be detected by them, notwithstanding every care, nor could any be clearly established by other technical men.

Herren Albrecht and Boyer delayed replying to the comments of Herren Bueb and Dicke in our German contemporary, so as to allow time for similar comments to be made on the English version of their paper as published in the "JOURNAL." Up to the present, they remark, no such comments have appeared in our columns.

* See "JOURNAL," Vol. LXXXII., pp. 752 and 789.
† *Ibid.*, Vol. LXXXV., pp. 337 and 404. ‡ *Ibid.*, Vol. LXXXVI., p. 956.

HENRY ALFRED WILLEY.

IT is with sincere regret that we record the death last Wednesday afternoon, at the early age of 41, of Mr. Henry A. Willey, Assoc.M.Inst.C.E., the Chairman and Managing-Director of Messrs. Willey and Co., Limited, of London and Exeter. Mr. Willey had not been in very good health for some time, and he was occasionally forbidden by his medical attendant to leave his room. He was none the less keenly alive to the progress of the great business of which he was the head, and by means of a telephone he was able, from his private house, to keep in touch with all that was going on at the works. Though it had been evident of late that he was failing rapidly, his interest in public affairs did not flag. This is shown by the fact that he gave a dinner to the members of the St. Thomas Constitutional Club on the evening of the 17th inst., attended the gathering, and delivered an address on tariff reform. The following afternoon he rode from Exeter to Tavistock and back on a new motor car he had recently brought from Paris; and it is thought that this ride proved too great a tax upon him. On Monday he became unwell; on Tuesday serious symptoms developed; on Wednesday he became unconscious. His ailment overmastered his powerful will; and he succumbed to it about three o'clock in the afternoon, to the irreparable loss of the undertaking which he had done so much to develop, and to the city which had profited in many ways by its success.

The firm of Messrs. Willey and Co. was founded in the early sixties by the late Henry F. Willey, who had been in the service of Mr. John Vickary, a gas-meter maker and gas engineer, in Fore Street, Exeter, but had left to start on his own account. In this venture he was at first associated with Mr. Ford, and he had a staff of about twenty employees. Mr. Willey quickly won for himself a prominent position in the industry in which he had cast his lot. Gas-works were being established in nearly all provincial towns of importance; and he was successful in securing a large portion of the work created thereby in the South-West of England and South Wales. His business capacity and the growth of the undertaking he had founded gained for him an honoured place among those citizens of whom Exeter is justly proud. He served the city for many years as Councillor, Alderman, and Justice of the Peace; in 1882 he was elevated to the office of Sheriff; and in 1893 the dignity of the Mayoralty was conferred upon him. He died on Feb. 27, 1894; and towards the close of the following year a tablet was placed to his memory in St. John's Hospital School, Exeter, in which he had been educated, by past scholars of the establishment. On the occasion of the unveiling of the memorial, the Town Clerk (Mr. G. R. Shorts) and Mr. E. A. Sanders, on behalf of the Governors, spoke very highly of Mr. Willey, not only as a man of business and a good citizen, but as a private individual.

On the death of Mr. Willey in 1894, the business passed into the hands of his second son, Mr. Henry A. Willey, whose early removal so many will now have cause to deplore. This was owing to the fact that the health of the eldest son—Mr. Arthur Willey—was too delicate to permit of his assuming the control of the undertaking; and he died of consumption in September, 1895, at the early age of 33. When Mr. Henry Willey took charge of the concern, the only works were situated in the Commercial Road. He, however, quickly recognized that the time was ripe for considerable extensions. Large works and offices in Haven Road were designed, laid out, and built throughout; and the old establishment was dismantled. In the space of five years, what had been an open meadow was converted into a busy hive of industry. In the various operations undertaken by the firm—which comprise iron and steel constructional work, the production of gas-meters, and the manufacture of brass and copper gas-fittings—employment is constantly found for upwards of 700 hands; while this number is greatly augmented during the execution of large contracts. The firm have three manufacturing works—two in Exeter and one in the North of London; and there are branches and depôts in six other important commercial centres in the country. Among work of which Mr. Willey was particularly proud was the erection of a large four-lift gasholder for the Plymouth Gas Company, which was made and put up by 500 men in nine months. Another good piece of work was the making and erection of a five-lift holder at the Rotherhithe station of the South Metropolitan Gas Company, in seven months from the date of the order; while other holders were put up at Torquay, Ilfracombe, and Barnstaple. With regard to the meters and fittings departments, a very large number of houses have been fitted up on the prepayment system in Plymouth, Devonport, Swansea, and Newport, where the firm hold exclusive contracts which have some years to run. Between 20,000 and 30,000 slot meters, and upwards of 500,000 gas-fittings were sent to London in a period of about five years. These figures give an idea of the progress made by a firm which commenced 45 years ago with a score of men. The new works were inspected by a large number of visitors, at the special invitation of Mr. Willey, in the spring of 1899, when their proportions and productive capacity elicited much admiration. At the dinner which was the concluding feature of the day's proceedings, Mr. Willey acknowledged his indebtedness to his brother (Mr. Sidney J. H. Willey), to the heads of all the departments, and especially to the workmen, for the assistance they rendered him in conducting

the business, and for the conscientious manner in which they discharged their various duties.

Mr. Willey's acknowledgment of the good service rendered by his employees was not confined to mere words. He recognized that those whose labour helped to produce the profit made in the business were entitled to a share of that profit, apart from the salaries or wages they were paid. Accordingly, towards the close of 1900—as the result of several conferences with Sir George Livesey and the officials of the Board of Trade—he notified his intention of redeeming a promise made eighteen months previously, and introducing a profit-sharing scheme on the 1st of January following; thus practically taking all the staff and workpeople into partnership. He explained that the preliminary notice was given in order that every employee might feel a personal interest in the work done, avoid waste of every description, and study the general economy and efficiency of the establishment, since everyone would henceforward, under certain conditions, share in the profits. The scheme was inaugurated early in the New Year at a social gathering of about a thousand of the employees, at which the Mayor (Mr. A. E. Dunn) and the Sheriff (Mr. T. Linscott) were present. Mr. Willey said he wished it to be clearly understood that the profits distributed would in no sense be a gift from him, and that if, in future, they took this shape, the scheme would be abandoned. He added that one of the great objects it was sought to attain was the saving of time and material. In April the following year, the distribution of bonuses was made to the men at the close of their day's work. Mr. Willey then took the opportunity of pointing out that while he realized that his own responsibility was to do everything he could to advance the welfare of the workers, he did not pretend that their share of the profits would be continued unless they honestly earned them by assisting in effecting economies. At the close of the address, several of the heads of departments expressed the appreciation of the men for the consideration shown to them. The next distribution took place on March 26, 1903; but, unfortunately, Mr. Willey was prevented by illness from attending it. He, however, sent a letter in which he asked the men to carefully consider what the profit-sharing scheme really meant, in order that it might be continued. He concluded by saying: "I feel in this matter I have done my duty by you; and it will be your fault, and yours alone, if I am obliged, by the keen competition, and by the heavy rates and expenses, to stop it. . . . If it continues, I shall be willing to consider a scheme whereby the men may add to their share any savings which they make—the business to pay them 5 per cent. interest on it." As bearing upon the relations of Mr. Willey with his employees, mention may be made of the starting, in June last year, of a newspaper, under the title of "Willey's Weekly," as a useful and practical means of intercommunication between the workers in the different departments, and as a medium for the free intercharge of ideas in connection with the business.

Mr. Willey's efforts to improve the position of workmen were not confined to his own establishment. In September, 1902, Exeter was visited by the then Lord Mayor of London (Sir Joseph Dimsdale), for the purpose of opening the Manual School of the city, which had been started and equipped mainly through Mr. Willey's generosity. The donor was unfortunately prevented from attending on the occasion; but he sent a letter in which he formally presented to the city the whole of the machinery and appliances of the school, and offered to maintain a scholarship during his life at one of the technical Universities in America, or else at an English technological college, so that students might "rise to the summit of the engineering profession." The Lord Mayor witnessed the lads at work in various departments of the school, and expressed his amazement at what he had seen. The City Council took over the school, and decided to open it daily, "so that apprentices at technical trades might spend a certain amount of time there." They publicly expressed their thanks to Mr. Willey for his gift, and decided to confer upon him the honorary freedom of the city—a distinction which would have been bestowed upon his father had he not been removed by death just at the time this was determined upon. The ceremony took place on Nov. 6, 1902; and in the course of the proceedings the Mayor (Mr. Dunn) said Mr. Willey had rendered considerable municipal service, and had shown great public spirit and benevolence. Ever ready to study the comfort of his employees, Mr. Willey acquired a large area of land near his works on which were erected houses for those engaged in them. He also established a large crèche—now almost ready for opening—for the training of girls in household duties. Another instance of his generosity was his gift a short time ago of a site for a new mission church on an estate not far from the works.

The late Mr. Willey kept a sharp eye on the course of events; and during the discussion of the fiscal question, he made some remarks thereon which, it may be remembered, led him into a controversy in our "Correspondence" columns. We pass over this matter, however, to come to another which will always stand out conspicuously in Mr. Willey's life-work. He decided to pay a visit to America; and on his return he recorded his experiences in the little publication, already alluded to, emanating from his firm. In the course of his travels, he found much, in connection with industry and municipal government, which he thought would be worth the attention of the artisans of this country. He therefore determined to send to the States a deputation, consisting of seven managers and workmen representative of the various departments of his business, to study the conditions affecting labour, the fiscal question, education, and other matters. In order to make their investigations as useful and as complete as possible, he arranged that the deputation should be accompanied by two representatives of labour organizations and friendly societies. The party left Exeter on Nov. 17, 1903, and their programme comprised visits to sixteen of the most important towns in the States. To Mr. Willey is due the credit of sending what we believe to have been the first commission of artisans who ever left this country on a similar errand. The tour was highly instructive from a commercial point of view—the visitors being everywhere received with the utmost cordiality. They left New York on the 15th of December, and arrived at Plymouth on the 21st, proceeding subsequently to Exeter. The next Monday they were formally welcomed home by the Mayor and Mayoress (Mr. and Mrs. Widgery), who had invited a number of representative citizens to meet them. Mr. and Mrs. H. A. Willey and Mr. S. J. H. Willey were present. Addresses were delivered by the delegates; and the Mayor heartily thanked them, and expressed his appreciation of the public spirit which had animated Mr. Willey in sending them on their important mission. The Bishop of Marlborough added that they owed Mr. Willey a far larger debt than Exeter could pay for what he had done. In this connection, it may be mentioned that the city is indebted to the generosity of Mr. Willey for the electric lighting installation in the Cathedral.

Towards the close of last year, an announcement was made that the business of which the late Mr. Willey was the head would forthwith, for family and other reasons, be registered as a private limited liability company under the Joint-Stock Companies Act. This was done in due course, and the new Company commenced operations on the 1st of January this year, under the same management as before. Mr. H. A. Willey continued to hold the position of Chairman and Managing-Director; and his colleagues on the Board were his brother (Mr. S. J. H. Willey), Messrs. Stephen Simpson and George Westlake (heads of departments), and Mr. F. T. Depree, J.P.—the last-named gentleman being the only outside Director. Mr. T. Glanfield was appointed Secretary. The new Company started, as was recorded in our columns at the time, with excellent prospects of doing a largely extended business. It is grievous to think that those prospects have been temporarily dimmed by the removal of one who would have had the principal share in bringing them to a successful realization.

The funeral took place on Saturday, and was marked by great solemnity—practically the whole city going into mourning. The *cortége*, consisting of a large number of carriages, left the residence of the deceased in Pennsylvania Park at about two o'clock, and proceeded to the Cathedral, where the first portion of the service for the burial of the dead was gone through. The Mayor and Corporation assembled at the Guildhall, and, joining the procession at Broadgate, preceded it to the venerable building; the civil regalia being borne before them craped. At the west door they were met by the clergy and choir; the former including the Bishop of Exeter, the Dean (the Bishop of Marlborough), and the Archdeacon. The nave was filled to overflowing. Next to the members of the family and personal mourners, precedence was given to the workmen of the deceased, who, to the number of 600, attended the service, which was choral, and at its conclusion headed the procession to St. Thomas's Churchyard, where the interment was to take place. There it was met by the Rev. J. H. Prince (the Vicar) and other clergy. The concluding portion of the service was read by the Rev. P. Williams (the clergyman of Mr. Willey's parish); and the coffin, which had been borne by sixteen of the oldest employees of the firm, was deposited in its last resting-place. The scene was impressive to a degree. Among the large number of Mr. Willey's personal and professional friends who attended the funeral were several gentlemen connected in various capacities with gas undertakings.

An Appreciation.

"One who Knew Him" writes: It is no exaggeration to say that Mr. Willey's death is a distinct loss to the commercial life of the country. In the West of England, with which his interests were more particularly bound up, he represented not only the spirit of enterprise in commercial affairs, and especially in the gas industry, but the most modern ideas in regard to education. He was a man to whom the Prince of Wales's appeal that we should "wake up" came as a personal call. Not, indeed, that there was any question of slackness or sleepiness in his own case. A man of weak constitution, frequently in indifferent health, of a quiet and placid manner, he was yet one of the hardest of workers, and among the most successful conductors of large business enterprises. He was, however, something more than a mere business man. It was his habit of mind to look upon his own constantly growing works as a unit in the industrial life of the country, and the stimulation of that life as one of the greatest blessings which could be conferred upon the people. His belief in education, and the conviction that British commercial interests suffer from the want of it, led him to establish classes, support schools, found scholarships, and offer prizes on a scale of quite remarkable generosity. It is not to be supposed that all whom he employed shared his views or appreciated his ideals. Still his relations with his workpeople were always most happy. By establishing a bonus system, he endeavoured to make them feel that the interests

of the undertaking which they were helping to build up were of personal concern to them. While their mental development was, in his opinion, of the utmost importance, he was not less anxious for their material welfare. The one he stimulated by opportunities for, and inducements to, study; while the other was promoted by the erection of comfortable homes in which they could live. His benevolence was widespread, and took many and sometimes unexpected forms. This is not the place to speak of some of the aspects of Mr. Willey's life. It must suffice to say that in business affairs he was as distinguished for integrity and sound judgment as for enterprise. Some time ago he was subjected to keen criticism in the columns of the "JOURNAL" for the course he pursued in advocating certain opinions on the fiscal question. In this matter the common judgment would probably be that zeal outran discretion. It was, however, characteristic of a man who did everything thoroughly. He was convinced heart and soul that a certain policy was necessary to the welfare of the country; and it was part of his nature to spare no efforts to bring others to the same opinion. This may have been a failing or a virtue; but what at least is certain is that England is the poorer to-day by the loss of one upright, strenuous, generous, and patriotic soul in Henry Willey.

Public References.

At the Bishop of Exeter's garden meeting at the Palace on Wednesday, his Lordship referred in feeling terms to the fact that Mr. Willey had intended to be with them that day, but had written expressing his regret that he was unable to be present. "Now," said his Lordship, "he has been taken from us." The announcement created a deep impression among the guests. At a meeting of the Conservatives in Trinity Ward on Thursday, a vote of condolence was passed with the widow and family of Mr. Willey, who for several years had been a member of the Conservative Union in the ward, and whose father had represented the ward in the City Council. The Chairman of the Exmouth Gas Company (Mr. J. Palmer), at the half-yearly meeting on the same day, referred to the fact that the late Mr. Willey was for many years Consulting Engineer to the Company, and said he had always given them the benefit of his advice gratuitously. The sound condition of the undertaking was in a great measure due to that advice. The Rev. C. R. Carr moved a vote of condolence with the family. He said his only acquaintance with Mr. Willey had been in the Company's office, and he then saw a remarkable man. His death would be a great loss to Devonshire. He was also a most generous-minded man. The resolution was carried. Sympathy was also expressed with the widow and family of Mr. Willey at the meeting on Friday of the Torquay Gas Company, in which he was a shareholder; Mr. Aitken, who moved the resolution, remarking that their lamented friend had a large heart, spent money freely for the benefit of others, and was an example of how a clear-headed man of business could also be a thorough gentleman. Mr. Willey was a member of the Tariff Reform League, and one of its most active supporters in Devon. An intimation of his death was sent by Mr. T. Insull, of Exeter, to Mr. Chamberlain, who, in reply, wrote: "I have heard with very great regret of the death of Mr. Willey, who was, as you say, a strong supporter of tariff reform. I had the pleasure of meeting him at Welbeck, and was grieved to see that even at that time he was not looking strong; but I hoped that, with comparative rest, his life would be preserved. He is a great loss to the cause we have at heart; and I sympathize deeply with his relatives and friends in their bereavement." Various references to Mr. Willey were made in many churches and chapels in Exeter on Sunday.

GAS ACTS FOR 1904.

THERE are now before us the Acts representing the sum of the legislative work of the past session so far as gas undertakings are concerned; and we commence to-day to set out the features that are special to each.

The Bishop's Stortford and District Gas Act incorporates the Limited Company of that name, and confers upon them a capital of £65,000, of which £23,000 is the original capital and £42,000 the additional capital. The standard dividend is to be 7 per cent. on the ordinary shares, 4 per cent. on the existing preference shares, and not exceeding 5 per cent. in respect of the preference capital authorized by the Act. Borrowing powers to the extent of one-third of the total capital are allowed. In addition to the ordinary powers as to reserve and insurance funds, the Company are authorized to form a renewal fund, equal to one-tenth of the paid-up capital, by appropriating out of revenue each half year a sum not exceeding ½ per cent. on the paid-up capital. Supplementary to the lands at present held by them, the Company have authority to purchase 10 acres. Special provisions are inserted as to the opening of roads for the protection of the Herts County Council. Among them, it is noticed that trenches are not to exceed 50 yards in length in places where only one cart can pass at the side, and not to exceed 100 yards in length where two carts can pass at the same time. A depth of 2 feet is stipulated to the upper surfaces of pipes hereafter to be laid. The same clauses are applicable, as far as possible, to the Hadham Rural District Council. The 2-feet depth is also found among the provisions for the protection of the Bishop's Stortford District Council. As to the supply of gas, the standard price is 4s. per 1000 cubic feet in the inner area, and 5s. in the outer area. Penny increases or reductions of price in any half year are to carry reductions or increases of 2s. 6d. per cent. upon the original capital and 1s. 9d. per cent. on the additional ordinary capital. In the matter of discounts, the Company are limited to 20 per cent. The illuminating power of the gas is to be 14 candles, tested by the "Wandsworth" burner. The Directors are also empowered to determine the remuneration of the Secretary. As was seen last week, the District Council do not intend exercising the authority given them by this Act to apply next session for powers to purchase the undertaking; so that all the provisions relating thereto will not now have effect.

By the Chippenham Gas Act, the Gas Company have been incorporated, and clothed with statutory powers. The capital is to be £41,000—comprising £10,000 of existing "A" capital, £6000 of "B" stock created in respect of money expended out of revenue upon extensions and improvements, and £25,000 of additional capital—the standard rates of dividend being respectively 10, 5, and 7 per cent., excepting on such part of the additional capital as is issued as preference capital, and this is to be entitled to a dividend of 6 per cent. In connection with the "A" and "B" stock, the Company may borrow a sum not exceeding £5333; and in respect of the additional capital, one-third. The Company are authorized to purchase a further 5 acres of land; but the powers conferred upon them of compulsory purchase of the scheduled land will, if not exercised, cease after three years. The standard price of the gas is to be 4s. per 1000 cubic feet within the borough and 4s. 6d. beyond; and penny variations in price will carry an increase or decrease, as the case may be, of the dividend by 2s. 6d. per cent. on the 10 per cent. capital, 1s. 9d. per cent. on the 7 per cent. capital, and 1s. 3d. per cent. on the 5 per cent. capital. This is the Act in which the variation of the Derby prepayment clause was first made, by which the extra charge beyond the ordinary price was fixed at 10d. per 1000 cubic feet, or 1s. including a cooker; while the maximum charge allowed for the hire of a prepayment meter, without fittings and cooker, is 6d. per 1000 cubic feet. Regarding discounts, the Company are permitted to grant up to 10 per cent. for prompt payment; but to consumers of large quantities of gas, they may give rebates "upon such scale, and subject to such conditions and regulations, as may be prescribed by special contract in writing between the Company and any such consumers." The illuminating power specified for the gas is 14 candles, using Sugg's "London" argand, and burning the gas at such a rate as shall give a light equal to 16 candles. The Wilts County Council have obtained the insertion of clauses compelling the Company, in connection with the breaking up of the streets, to give seven days' notice instead of the three specified in section 8 of the Gas-Works Clauses Act of 1847, and absolving them from any liability to damage for accidents caused by steam-rollers or other engines belonging to them in the case of pipes laid, after the passing of the Act, at a less depth than 2 ft. 6 in. A purchase clause to be exercised by the Corporation in the "next available session" appears in the Act; and, as is now usual, compensation for officers and servants who are not continued in the service of the Corporation is provided for.

The incorporation and extension of the powers of the Corbridge Gas Company have been effected by the next Act. The capital is to be £16,500, consisting of £7000 of existing ordinary share capital, £2500 representing the amount expended by the Limited Company out of revenue upon extensions and improvements, and £7000 of additional capital, with a standard dividend of 5 per cent. in all cases. Inclusive of £700 already borrowed, the Company may borrow one-third of the amount of the additional capital. The standard price allowed in Corbridge and Dilston is 4s. 2d. per 1000 cubic feet, and 5s. beyond these parishes. In this instance, 1d. increases or reductions, in any year, carry variations in dividend of 2s. 6d. per cent. on all classes of the capital. The Company may go up to a 15 per cent. discount for prompt payment; but the discounts and rebates to large consumers are left open to agreement. Fourteen-candle gas is prescribed, tested with a Sugg burner designed for testing gas of 14-candle power. Additional lands to the extent of 3 acres may be purchased by agreement.

By the Felixstowe Gas Act, the dissolution and re-incorporation, with enlarged powers, of the Limited Company operating in the district named, have been provided for. The capital is £49,970, comprising £7970 of existing preference stock, £9000 of existing ordinary stock, and £33,000 of additional capital. The standard dividends are 10 per cent. on the original ordinary capital, 7 per cent. on the additional capital, and 5 per cent. on the preference stock. Borrowing powers are allowed to the amount of one-third of the issued capital. The Company are permitted to build up a renewal fund to an amount equal to 10 per cent. on the paid-up capital for the time being, by the annual appropriation of an amount not exceeding 1 per cent. on the paid-up capital. For the purposes of their works, they have power to purchase by agreement an additional 5 acres of land. For prompt payment, the Company may allow discounts not exceeding 10 per cent.; but they are limited to an additional amount not exceeding 15 per cent. in respect of large consumptions. The illuminating power of the gas is to be 14 candles, tested by

the "London" argand No. 1 burner, "with a 6 in. by 1¾ in. chimney; but if at any time, and so long as, the gas-flame rises above the top of the glass, a 6 in. by 2 in. chimney shall be used." The standard price is 4s. 4d. per 1000 cubic feet—penny changes above or below carrying a variation of 5s. per cent. on the 10 per cent. capital, and 3s. 6d. per cent. on the 7 per cent. capital.

By the Hampton-in-Arden Gas Act, the Hampton-in-Arden and Meriden Gas Company are incorporated, and authorized to supply with gas certain parishes in the county of Warwick. The capital is £15,000, with one-third borrowing powers. The Company have authority to purchase, for the purposes of their works, 5 acres of land. The maximum price of gas is fixed at 5s. per 1000 cubic feet. The illuminating power is to be not less than 14 candles; the testing provisions being identical with those in the Felixstowe Act.

The Harlow and Sawbridgeworth Gas Company are incorporated and their area and powers defined by and in the Act for which they applied. The capital is £33,000, whereof £21,000 is the original and £12,000 the additional capital; and, when fully paid up, the Company may convert into stock the whole or any part of this capital. On the original capital, the standard dividend is to be 5 per cent., and at the same rate on the additional capital whether issued as ordinary or as preference. The power to borrow is limited to £7500, and the interest to a rate not higher than 5 per cent. The standard prices for gas are 3s. 11d. per 1000 cubic feet supplied within a radius of 2½ miles from the existing gas-works, and 4s. 6d. beyond—penny reductions or increases in any year carrying half-a-crown variations in dividend. The price for the supply of gas to the public lamps in the districts of the Sawbridgeworth Urban District Council and the Hadham Rural District Council is not to be greater than that charged to private consumers, and is to be subject to a 5 per cent. discount; or, if the Urban District Council so elect, the price may be the same as that charged by the Company for lighting purposes to any trader in that district. The Herts County Council have secured the same protection as in the case of the Bishop's Stortford Act. The Company are empowered to purchase by agreement an additional 5 acres of land. They are prohibited from ever selling their undertaking, or any part of it, to any local authority without previously offering to sell the portion situated in Sawbridgeworth to the Council of that district; and, in the event of their agreeing to purchase, the Company are not to oppose their application for the necessary powers. The illuminating power of the gas is to be 14 candles, tested in Sugg's argand burner made for gas of this power.

The Matlock and District Gas Company's Act is specially noticed on p. 865.

In the Act incorporating and conferring powers on the Wellington (Somerset) Gas Company, the capital is fixed at £32,500, divided as follows: £14,000 original "A" stock; £3500, being ("B") stock created by the Act in respect of money expended by the Limited Company out of revenue on extensions and improvement and working capital, and to be distributed among the members of the Company registered before the passing of the Act; and £15,000 additional capital. The whole or any part of this additional capital, when fully paid up, may be converted into stock. The rates of dividend are to be 10 per cent. on the "A" stock, 5 per cent. on the "B," and 7 per cent. on the additional capital, or 6 per cent. on any part of it issued as preference stock. In respect of the "A" and "B" stocks, the Company may borrow a sum not exceeding £5833, and one-third in respect of the additional capital. By agreement they may purchase a further 3 acres of land. The standard price of gas is 4s. 3d. per 1000 cubic feet, with a rise or fall of dividend of 2s. 6d. per cent. on the 10 per cent. stock, 1s. 3d. per cent. on the 5 per cent. stock, and 1s. 9d. per cent. on the 7 per cent. capital for variations of 1d. in price in any half year. Up to 10 per cent. discount may be allowed for prompt payment, and not exceeding an additional 15 per cent. to large consumers. The prescribed illuminating power of the gas is 14 candles, and the testing-burner is the "London" 16-candle No. 1 argand, used so that the gas shall be burned at a rate to give a light equal to 16 candles. The Company are authorized to apply for electricity supply powers; while the District Council have secured the right—extending over the inordinately long period of twenty years—to apply without opposition for power to purchase the undertaking.

The Yorktown and Blackwater Gas Company are also to be dissolved and reincorporated with extended powers. The limits of supply as defined by the Act include a portion of the area within which the Ascot District Gas Company were, by their Act of 1882, authorized to supply; but as they have never exercised the power in the area referred to, it has been determined by this new Act. Sandhurst and Crowthorne now form part of the Yorktown Company's area. The capital of the newly authorized Company is fixed at £50,000, of which £38,200 is additional capital. When fully paid up, the Company may convert any part of this into stock. Including £2450 already borrowed, the Company may borrow to the extent of one-third of the issued capital. The standard dividends are to be 10 per cent. on the original capital, 7 per cent. on the old additional capital, 5 per cent. on the old preferred capital, and 7 per cent. on the new additional capital, or 5 per cent. on any part issued as preference. The standard price of gas is to be 4s. 3d. per 1000 cubic feet; and for 1d. reductions or increases, the dividend is to rise or fall by 5s. per cent. on the 10 per cent. capital, and 3s. 6d. per cent. on the 7 per cent. A 10d. excess in the price of gas is allowed for supplies including a prepayment meter and fittings, or 6d. for a meter only. Discounts are limited to 10 per cent. for prompt payment and 15 per cent. in addition to large consumers. The standard illuminating power is 15 candles; and the conditions for testing are the same as in the case of Felixstowe. The Company may appropriate 1 per cent. annually for a renewal fund, and may so accumulate an amount equal to 10 per cent. on the paid-up capital. They have also secured power to construct, within the next five years, a railway from the South-Eastern line to the gas-works. The right to compulsorily purchase certain lands has been conferred upon them for three years, and, by agreement, they may acquire 5 acres more. Power to apply for authority to supply electricity is conferred; but, in this case, the previous consent of the Frimley District Council must be obtained.

(*To be continued.*)

A GAS-DRIVEN ELECTRIC LIGHT PLANT.

An instructive and well-illustrated article on this subject appears in this month's issue of "Public Works." The author is Mr. Arthur H. Allen, who is the Assistant Editor of a well-known electrical journal, and therefore has had exceptional opportunities for studying his subject. Though the particular plant with which he deals is driven by producer gas, there are certain considerations in the article which should not miss the attention of gas engineers.

It is, as Mr. Allen says, a singular fact that, in spite of the extraordinary progress which has been made during the last few years in the design and construction of large gas-engines, there is but one large public installation of electric generating plant in this country—that of the Urban District Council of Walthamstow—which is entirely driven by producer gas. It is true that attempts have been made from time to time to utilize gas-engines for generating electricity for public and private light and power supply—notably at Coatbridge in 1894, at Belfast in 1895, and at Northwich, King's Lynn, Redditch, Saltburn, and Galway. The two first-mentioned have now abandoned the use of gas-engines entirely, and Northwich is supplied, at a very cheap rate, with Mond gas from the works of Messrs. Brunner, Mond, and Co. None of the other stations has ever attained any conspicuous success; and in one instance—that of King's Lynn—the gas-engines are being displaced by steam. Yet none of these stations contains plant of half the capacity of the Walthamstow Electricity Works, which have been remarkably successful in every way. Mr. Allen overlooks the contract the Northern Counties Electricity Supply Company have entered into with the Malton Gas Company for the supply of gas for their engines at 2s. per 1000 cubic feet.

However, the reasons why the results generally obtained have been so discouraging are not far to seek. First, the generating sets have been of absurdly small size, and often the dynamos have been driven by belts from the engine fly-wheels. Secondly, the plant has not been the best adapted for central station work. Thirdly, the plant has been placed in the charge of an engineer whose whole training has been associated with steam-engines, and who, when extensions are called for, not unnaturally prefers to instal the kind of machinery with which he is best acquainted. Among other important reasons which have contributed to the want of success of gas-driven plants, Mr. Allen places town gas, which, he says, is comparatively costly, besides being far less suited for use in large gas-engines than a gas of lower thermal quality, and containing a lower percentage of hydrogen. But, apart altogether from the question of working cost, that of the nuisance due to vibration caused by the motion of the reciprocating parts of the engines and by the escape of the waste gases from the exhaust-pipes must be reckoned with. The trouble sometimes met with of back-firing, has also given rise to serious complaints. In fact, it was owing to the last mentioned fault, that the gas-driven plant at Leyton was shut down; an injunction having been obtained by a resident in the neighbourhood to prohibit the continued working of the engines. A similar case occurred this year at Ryde, where a new power-station, driven by gas-engines, was shut down by injunction on account of the nuisance to neighbours, whose property was eventually purchased by the Electricity Company, as the best way out of the difficulty. It is clear, therefore, that one of the most important considerations in laying down a gas-driven plant is that of choosing a site where no trouble due to the vibration nuisance and back-firing need be feared. An alternative, however, is to select a type of engine which is free from both vibration and misfires; and this is the case to a great extent at Walthamstow. The station, in fact, is situated in close proximity to a number of dwelling-houses, but nevertheless has escaped from the persecution which has befallen so many of its like.

It is truly pointed out by Mr. Allen that, although the system of gas-producer, cleaning plant, and engine is not altogether free from complication, the first impression received by the visitor to a gas-driven plant is that of the simplicity of the installation. This impression is on the whole justified, for a steam plant equipped with all the modern accessories devised for the

purpose of securing small economies, is far more complicated than the gas plant. "The latter possesses an enormous advantage in that the gas is neither hot, nor at high pressure, nor can it be condensed in the pipes." Hence costly pipes, elaborate pipe coverings, and automatic traps are not needed. Condensers, with the corresponding air and circulating pumps, economizers, feed-water heaters, superheaters, chimney shafts, expansion joints, ring mains, and a superfluity of stop-valves—all these are dispensed with, together with their inevitable losses. Instead, there remain usually a small boiler, one or more gas-producers, low-pressure piping, cleaning plant for the gas, a gasholder, starting-gear for the engines, and the engines themselves. In either case a supply of cold water, or a cooling tower to cool the hot water from the condensers or the water-jackets as the case may be, must be provided. The electrical plant, from the dynamos to the switchgear and cables, remains unmodified by the substitution of gas for steam as the prime mover. The staff required to work the station, and the quantity of fuel used for a given output, are both materially reduced; and as these are important items, the resulting economy is considerable. The capital cost, including all accessories, is not materially different from that of a steam-driven plant; the principal items being the engines. The working cost is unquestionably less, provided the right type of engine is adopted, and the plant receives reasonable care.

At Walthamstow, there are seven Dowson producers; and the gas is made continuously as required. But a 25-feet gasholder is provided to ensure a uniform supply to the engines; and a second one is shortly to be installed. The cost of the gas, including fuel, wages, repairs, &c., is stated to be about 2½d. per 1000 cubic feet; but, as the gas has only one-fourth the thermal value of coal gas, its net cost in comparison with the latter is 10d. The consumption of fuel is less than 1 lb. per brake horse-power-hour, as compared with three times this quantity for steam plant under similar conditions. As a matter of fact, in ordinary working, owing to the unfavourable conditions, many electricity works with steam-driven plant use from 6 to 9 lbs. of coal per brake horse-power-hour; much fuel being employed in keeping up steam when the load is very light, and getting up steam in cold boilers. From most of these stand-by losses, gas-driven plant is free. Repairs in the case of a gas-producer are also a small item as compared with that of a steam-boiler, especially if the latter be of the water-tube type and the feed water dirty. Add to this that a gas-engine can be started up and put on load within about two minutes, while a steam-engine has to be warmed up gradually before it can be used, and it will be seen that the former has some decided advantages over the latter for electricity supply station conditions.

The plant at present installed consists of four small and three large generating sets; the dynamo being in each case coupled direct to the crank-shaft of the engine. The smaller engines are rated at 135 indicated horse power each, and run at 260 revolutions per minute; the large ones are rated at 300 indicated horse power each, and run at 200 revolutions per minute. All the engines were made by the Westinghouse Company, who have also three additional engines of the larger size on order for the station. The engines are of the vertical single-acting three-cylinder type, working on the "Otto" principle. They are started by means of compressed air, which is stored in tall vertical tanks fixed against the wall of the engine-room. The smaller generating sets are provided each with its own air-compressor; but separate compressors, driven by electric motors, are also installed. The mode of starting is exceedingly simple. One of the cylinders of the engine is operated as a compressed air-engine for the nonce, by turning a valve which cuts off the gas supply, and admits compressed air in its place. Provision is also made for shifting the cams which actuate the exhaust-valves, so that the latter are allowed to open in the remaining cylinders during the compression stroke—thus relieving the pressure, and allowing the engine to gain speed smoothly. As soon as an explosion takes place in one of the cylinders, the compressed air is turned off and the exhaust-valves are restored to their normal working cycle, and the engine runs up to full speed. The whole operation is very much more expeditious than the starting of a steam-engine of equal power. Whereas the latter would have to be gradually warmed up before it could be thrown on the load—an operation occupying from fifteen minutes to an hour or more—the gas-engine can be started and fully loaded within two minutes, without fear of injury to the mechanism. The whole operation can, of course, be carried out by one man with ease. A fly-wheel is provided at each end of the crank-shaft, to ensure steady running; that at the back being provided with slots to enable the engine to be barred round by hand.

The working results obtained at Walthamstow show clearly the economical performance of the gas plant. Though the total output of the works in the year ending March, 1903, was only half-a-million units, the cost of coal per unit was only 0·42d.—a better record than could be shown for the same period by any of the Metropolitan municipal electricity works. Even Hackney, where the cost of fuel is 0·48d. per unit, with an output three times as great, did not equal this record; while Stepney, with about the same output as Hackney, showed a fuel cost of 0·65d. per unit. It is clear that there is every prospect that in a few years at the outside the total working costs at Walthamstow, as well as the fuel cost, will be the lowest in the neighbourhood of London.

ROSTIN'S AUTOMATIC LAMP LIGHTING AND EXTINGUISHING SYSTEM.

The question of the automatic lighting and extinguishing of street-lamps is one on which the minds of many men have been brought to bear, with the result that several ingenious devices, more or less successful, have come before us. But among them all we have not hitherto met with one, actuated by the alteration of the pressure of the gas itself at the gas-works or other central station, that has been altogether satisfactory. The reasons need not be discussed here, as the object of the present article is to bring to notice a new system which is operated on this principle, and which it has been demonstrated conclusively does execute its purposes with pleasing certainty.

In dealing previously with this subject of the automatic ignition and extinguishing of street-lamps, the endeavour has been made to put before readers the economical advantages, given a reliable system, of such a method of lighting—for instance, the saving in labour, the saving in gas through the simultaneous lighting and extinguishing of the whole number of lamps in a district, and the saving of mantles through the absence of the not always gentle handling of the lamp-lighter's torch. It is for those who are responsible for public lighting to determine whether the cost of the installation of an automatic system is a justifiable price to pay for securing these and other advantages that may occur to one on thoroughly considering and inquiring into the subject. The expenses of lamp-lighting and extinguishing are, of course, great; the gas wasted by the tedious human system of doing the work is also great; and the torch is responsible for much mantle destruction. When, again, one comes to compare a clockwork system of automatic lighting with one controlled by a slight variation of pressure for a few minutes above the maximum required for the ordinary purposes of a district, one cannot fail to see that there are points of advantage in favour of the latter, if a perfect system is available, inasmuch as the mechanism is of a less delicate character, and there is not the labour, small though it may be, involved in winding up the mechanism. In the case of fog suddenly appearing, too, the clocks being set to one special time would be useless; and it is in such an event that the pressure system would excel. This, however, does not condemn the one in favour of the other, as arguments can be adduced from both sides.

Though, as has been intimated, the pressure devices that have hitherto been brought to notice have not convinced us of their safety in action, of course, time must work out improvements in these as in most other things of utility; and Dr. H. Rostin, of Berlin, has shown that the last word has not been said on this particular principle of automatically lighting and extinguishing lamps. For some two years, he has been energetically working at it; and now he comes forward with his perfected invention. Not only so, but he is supported, and strongly, by the practical experience in its use of Mr. Theodor Grothe, the Manager of the gas-works at Altenburg, in Saxony; and we are able to supplement this description by an interesting account of an investigation into the use of the system there by a well-known English gas engineer. Tests confirming the claims of the inventor and the Altenburg experiences have been made at Meerane, Saxony, and in other towns. Speaking generally, there is no doubt that Dr. Rostin has eliminated, in an exceedingly skilful way, the objectionable characteristics of pressure-operated predecessors. The mention of only one or two points, before passing on to describe the new arrangement, will induce readers to give to the latter the attention that it deserves. The points are these: The apparatus can be regulated to work at any desired increase of pressure—slight or large—above the maximum requirements of the district. This increase is only needed for a few minutes, and not constantly during the time the lamps are alight; and the extinguishing is also accomplished by an increase (and not decrease) of pressure. These are obvious advantages.

In describing the arrangement, it will be easy for the reader to comprehend it by consulting figs. 1 and 2. The principal parts of the appliance to which reference will have to be made are,

first, the two small glass cylinders *l* and *m*, which contain bulbous shaped glass floats *n* and *o*, acting on a solution of glycerine and water, which has communication between the two cylinders by a bent tube at the bottom, as illustrated. (There is a little similarity here with the action of the manometer.) The necks of the floats contain mercury, which seal or unseal, as the case may be, the tubes *p* and *r*. These tubes communicate with the reservoir *g*, in which is a bell *f*, also sealed in mercury. The reservoir contains a block of plaster of Paris, which considerably diminishes its capacity, and so causes the amount of gas required for the operation of the bell to be infinitesimal. The guide *h* is raised and lowered by the bell. Passing through a slot in the side of this guide is a small weighted lever *i*, which is actuated by the rising of the guide, and gives motion to the cog-wheel cock *c*, which cock opens or closes the burner supply-pipe *b*. A pilot light is served by the pipe *e*; but the jet is extinguished while the burner is alight.

Now when the pressure to which, or above which, the appliance is adjusted (this being higher, as fancy dictates, than the maximum required in the district) is applied at the gas-works, gas passes through the tube *t* into the cylinder *l*. This depresses the glass float *n*, causing the glycerine and water solution in *m* to rise, and seal the tube *r* in the mercury in the neck of the float *o*, at the same time unsealing the pipe *p* connecting the cylinder *l* with the reservoir *g*. The gas passes up *p* into the reservoir, and raises the bell and the guide *h*. The latter takes with it the lever *i*, which, during its travel, moves the wheel by one cog—thus opening the gas-supply cock, and so causing the burner to be ignited. The tap turns in one direction only; and it is prevented

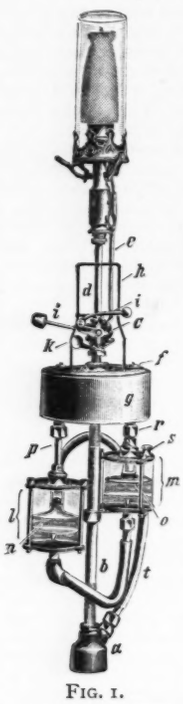


FIG. 1.

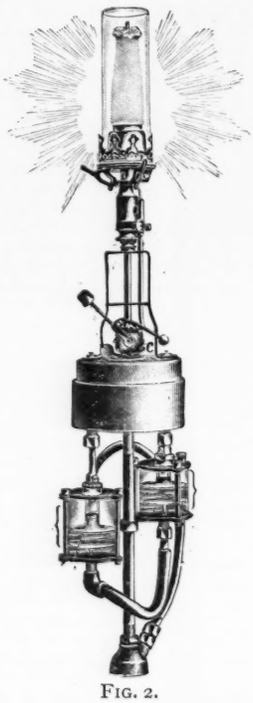


FIG. 2.

making any backward movement by the pawl *k*. As soon as the turning on of the gas and the lighting is accomplished (and it only takes, say, two or three minutes in the farthest part of a district), the pressure at the works may be reduced to the normal. On the return to the ordinary pressure, the tube *p* once more becomes sealed in the mercury in the neck of the float *n*, and the tube *r* becomes unsealed. The result of this is that the slight amount of gas that has been used for operating the bell of the gas reservoir escapes down *r* into the cylinder *m*, and away into the open air by the small capped outlet *s*—thus causing the bell to fall in readiness for the next operation. When the time for extinguishing the lamps arrives, the increase of pressure at the works again produces the performance of the same cycle of simple operations in connection with the appliance attached to each lamp. This moves the wheel one cog forward, and so closes the gas supply, at the same time igniting the pilot-jet. It will be understood that, when the pressure is not on to which the appliance is regulated, no gas can pass into the reservoir *g*.

The arrangement is equally applicable to clusters of burners as to single ones; and, by increasing the gas-ways, one or more burners of the cluster can be extinguished at any time by the means already described. This will be recognized without more specific explanation, and its value appreciated.

The whole appliance is beautifully made; and strength and imperishability come next in the order of merit to the certainty of operation. It is very sensitive, too, to the smallest increase of pressure above that at which it is set to operate. Every appliance at the outset requires individual adjustment (which is easily accomplished) according to the situation of the lamp; and herein is a factor of security, as all the lamps can be set to operate only at the pressure which is demanded by the worst situated lamp in the area of supply. No objection can be raised against a temporary accession of pressure in a district. The advantages of the system as seen by Mr. Grothe, after his experience at Altenburg, are these: "It is an entirely new system, though based on old approved principles; perfectly reliable action; the apparatus adapts itself to the existing conditions of the gas-works; it necessitates no alterations; no special increase of pressure is required for ignition; the differences between day and night pressure can be made to suffice; a fall of pressure does not influence the apparatus, the lights continuing to burn; few movable parts; durable construction; tightly closing taps; working parts unaffected by atmospheric influences or dust; long life; the apparatus cannot be tampered with, the initiated only being able to work it by hand; the apparatus can serve lamps with one or several lights, and extinguish the burners as required; all street-lamps in the town are under the perfect control of the gas-works; great saving in wages and gas." This is a very comprehensive list of advantages, which the engineer previously referred to confirms from his own observation, as is seen from the following communication on the subject.

"From the numerous patents which have from time to time appeared, one would have thought that ingenuity had been exhausted in devising apparatus for effecting the automatic lighting and extinguishing of public gas-lanterns; and it was with no small feeling of curiosity—and, it might be added, doubt—that an invitation was accepted, together with some German *confrères*, to visit Altenburg, in Saxony, to see what was claimed to be a *fait accompli* in this respect. Our first feelings on examining the street-lanterns were those of astonishment at the neatness and compactness of the apparatus, and how little it interfered with the appearance of the lanterns; and our astonishment and admiration were complete when we saw how regularly and with what precision the apparatus worked. It was certainly a novel experience, while enjoying our 'Spatenbraw,' to see the lanterns in the public streets suddenly extinguished, and then re-lighted for our edification; and it was especially interesting to watch one lantern on a high hill isolated from his fellows in the valley (for the town of Altenburg is very irregular, being a series of hills and valleys) keeping time with the extinguishing and lighting operations. In a general way, we supposed the local police would have paid a domiciliary visit to the gas-works to know what was the matter, and to promptly inflict a fine for irregularities tending to upset public order; but we fancied the gendarme was used to these demonstrations for the benefit of admiring visitors, which added to the fame and glory of Altenburg! The apparatus had then been working for six months; and although covered with dust, &c., there was not a single failure to record, and Direktor Grothe, the Engineer, was loud in praise of the system. Certainly, if it continues to perform its functions with the exactitude we observed, it appears that the problem of automatically lighting and extinguishing street-lanterns has been solved—thanks to the patience and ingenuity of Dr. Rostin."

[Mr. Sidney Hersey represents the inventor in England.]

Utilization of Tar from Water Gas.—A patent has been taken out for France by M. Scholvien for utilizing the tar produced in the manufacture of carburetted water gas. The tar is distilled till the residue consists only of pitch. The distillate is treated with acid and then with alkali, and distilled as long as the distillate remains clear. Any further distillates are treated in the same manner as the original tar, and the products are mixed with the clear distillate. The resulting liquid has a specific gravity of ·82 to ·9, and a flashing-point of 30° C., and it consists principally of unknown hydrocarbons, with small quantities of toluene, xylene, mesitylene, and traces of naphthalene. It does not contain sulphur or phenols, and is a solvent for gums, resins, &c.

Incomes from Water-Works.—A fortnight ago we gave an extract from the recent report of the Inland Revenue Department, dealing with incomes derived from gas-works undertakings. The same return shows that water-works have exhibited a gradual increase from 1893-4 to 1902-3; the gross income assessed in the latter year being £4,832,637, or £1,024,458 more than in 1893-4, equal to 26·9 per cent. There was a slight increase in 1902-3 over 1901-2. As in the case of gas-works, the profits of the preceding year are taken as the basis of assessment; and the figures for the period named were: In 1893-4, £3,808,179; 1894-5, £3,936,089; 1895-6, £3,962,777; 1896-7, £4,015,316; 1897-8, £4,305,708; 1898-9, £4,537,135; 1899-1900, £4,614,317; 1900-1, £4,676,497; 1901-2, £4,706,725; and 1902-3, £4,832,637. The last-named sum was divided among 1881 undertakings, 433 of which belonged to persons, 100 to firms, 343 to public companies, and 1005 to local authorities. A profit of £19,561 was made by works owned by individuals, and one of £19,212 by those in the hands of firms. The 343 concerns under company management returned practically the same profit as the 1005 belonging to local authorities; the figures being £2,347,605 and £2,446,259 respectively. The Metropolis includes fifteen undertakings—fourteen in the hands of companies with a profit of £1,370,954, and one under a local authority with £1537. In England, 555 of the water-works included in the return are administered by local authorities, in Scotland 416, and in Ireland 34; the numbers of public companies being 278, 63, and 2 respectively.

THE PROVAN WORKS OF THE GLASGOW CORPORATION GAS DEPARTMENT.

THIRD ARTICLE.

[With this Issue is published Plate No. 7, showing the Details of the Gasholders.]

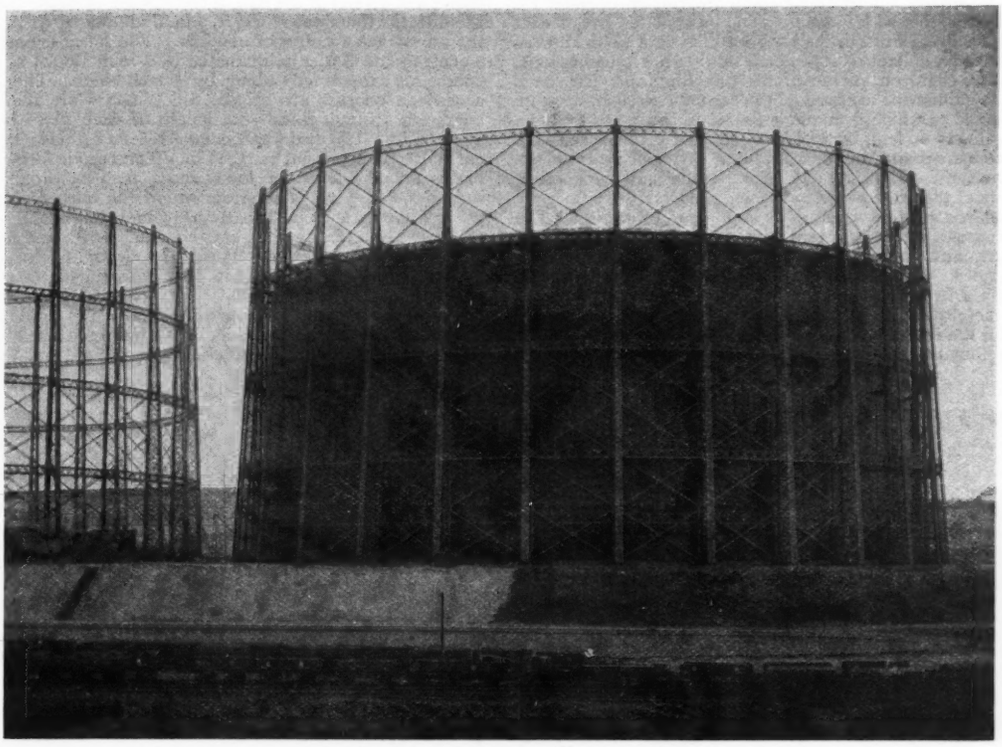


FIG. 32.—VIEW OF THE GASHOLDERS.

LEAVING the meter-house, we pass the brick-works, the engine and boiler house, and the large extent of ground allocated to future extensions of the purifier plant, and come to the two three-lift holders which have been constructed in the south-east corner of the site. These holders have each a capacity of 8½ million cubic feet; and at the time of the visit one was in use, and the other was in course of construction. Over the other side of the Caledonian Railway, an area is pointed out that has been set apart for three other holders, as they are required. Originally, it was Mr. Foulis's intention that these additional holders should also have a capacity equal to those already constructed; but Mr. Alexander Wilson may have different views on this matter, so that it must not be taken that the original idea will, or will not, be adhered to.

THE TANKS OF THE GASHOLDERS.

However, on the design of the two erected holders, Mr. Foulis concentrated a large amount of thought and skill. Their site demanded extensive levelling, before the actual work of excavation commenced, in order to allow the trainers to be worked round the whole circumference of the projected tanks. The borings, too, showed that the subsoil (which was principally boulder clay) was interspersed by a not inconsiderable amount of rock. In short, the construction of the tanks for the holders—under the most propitious circumstances a work of considerable anxiety—was rendered more so by the large amount of preliminary detail which had to receive the most scrupulous attention. Some idea of the amount of excavation which had to be dealt with will be gained when it is mentioned that each tank is 283 ft. 7 in. diameter and 50 ft. deep from the top of the cope to the bearing-stones. The materials excavated had to be deposited on the lower portions of the site, and rammed hard in layers of not more than 12 inches thick. All irregularities, too, on the face of the rock were trimmed off, so as not to interfere with the uniformity of the thickness of puddle behind the walls; and fissures in the rock were filled with portland cement, mixed with its own bulk only of clean sharp sand, in order to avoid any possibility of accident. In the foundations, too, all irregularities were filled up with concrete before the work of putting in the puddle commenced. The character of, and the method of dealing with, the puddle was described in the first article. The puddle was carried up with the brickwork; and the earthwork in the embankment which had to be formed, and behind the puddle, had to be rammed hard in layers not exceeding 12 inches thick. The material used for a distance of 2 feet behind the puddle was freed from stones, and was pounded into a compact mass to prevent any bulging of the puddle. Over the whole surface of the puddle on the bottom of each tank, there is a 9-inch layer of concrete.

Respecting the wall, the foundations are 20 ft. 10 in. broad, and 14 in. thick. For a height of 18 ft. 10 in., it is 7 ft. 6 in. thick; the next 8 ft. 6 in. is 6 ft. 8 in. thick; the succeeding 8 ft., 5 ft. 6 in. thick; the next 8 ft., 4 ft. 8 in.; and the remaining 6 ft. 8 in. to the underside of the coping-stones, 3 ft. 6 in. thick. The piers for the standards number 30; and each is 11 ft. 6 in. from the face of the wall to the back of the pier, and 6 ft. broad. Each tank has two wells, 6 ft. 8 in. square, formed in the brickwork of the wall, with arched openings communicating with them from the interior of the tank. At the foot of each well, there is a pit, 15 ft. 6 in. long by 6 ft. 8 in. wide and 4 ft. 3 in. deep; and at these places the wall of the tank is carried down to the bottom of the brickwork of the pits. The coping-stones on the walls are 3 ft. 9 in. broad, about 4 ft. long, and 1 ft. thick; while the cope on the top of each pier for the standards is in four stones, each 5 ft. 10½ in. long, 3 ft. broad, and 1 ft. 3 in. thick. The bearing-stones are of granite 6 ft. 6 in. long, 18 in. broad, and 12 in. thick. The centre pier is 17 ft. diameter, and about 35 ft. high; and it rests on a platform of creosoted redwood, 20 ft. square, formed of two courses of planks 12 in. broad and 6 in. thick, laid crossways. The smaller piers also rest on wooden platforms, consisting of two thicknesses of 1½-in. red pine wood, creosoted and nailed crossways. The timber framing for supporting the crown of the holder is constructed of pitchpine; the top of the surface of this framing having a radius of 400 feet.

THE GUIDE-FRAMING.

Both the gasholder and the framing are constructed of Siemens-Martin mild steel; and it was stipulated that it should be capable of bearing a tensile strain of not less than 26 tons, and not exceeding 30 tons per square inch of section, with an elongation of 20 per cent. on a length of 8 inches.

The framing consists of thirty standards, 152 ft. 6 in. high from the level of the cope of the tank, 9 ft. ¾ in. wide at the base, tapering to 2 ft. 1½ in. at the top. The front member of each standard is composed of one ½-inch and one ⅜-inch plate, 3 feet broad at the base, and tapering to 1 ft. 6 in. at the top, riveted together with ⅞-inch rivets, and ½-inch web plate, 1 ft. 3 in. broad at the base, tapering to 9 inches at the top, and two angles 6 in. by 5 in. by ½ in. riveted to the front and web plates. The back member is composed of a ½-inch plate, 3 feet broad at the base, tapering to 1 ft. 6 in. at the top, and one ⅜-inch plate of corresponding breadth, carried up a distance of 78 ft. 6 in., measured from the bottom of

the standard. The two plates are connected together as described for the front member. Two $\frac{3}{8}$-inch cover plates, 7 ft. 6 in. long, are fitted between the angles at the top of the standard, so as to bind the two members together. The front and back members are strengthened by gusset-pieces, and tied together by horizontal and diagonal bracing. The bottom of the standard is composed of a $\frac{5}{8}$-inch sole-plate 8 ft. 11 in. long and 3 ft. broad, and an upright web plate, $\frac{1}{2}$ inch thick and 4 feet broad, riveted together and strengthened by angles. The base plates are of cast iron, 10 inches deep, fixed to the tank wall by eight bolts 2 inches diameter in body, $2\frac{1}{2}$ inches at the ends, and 12 ft. $10\frac{1}{2}$ inches long, secured to two cast-iron anchor-plates 5 ft. long and 3 ft. 6 in. broad. The guide-runs are formed of channel-bars, 6 in. by 3^1 in. by $\frac{1}{2}$ in., riveted to which is an angle-bar $4\frac{1}{2}$ in. by 3 in. by $\frac{3}{8}$ in. A $\frac{3}{8}$-inch plate, 13 in. long by 12 in. broad, is riveted across the back of the channel and angle-bars about 3 ft. 8 in. apart in the height of the runs. The sixty guide-runs in the tank are made of channel-bars of the dimensions mentioned above.

The standards are tied together by four rows of girders. The first row consists of two girders 3 ft. 6 in. deep, placed 5 ft. $3\frac{5}{8}$ in. apart, and braced together both top and bottom by diagonal angles. Cover plates 4 ft. by 4 ft. 1 in. by $\frac{3}{8}$ in. thick, and 4 ft. by 4 ft. 3 in., connect the plates on the top and the bottom of the girders, so that they form a continuous box-shaped girder round the framing. The second row of girders is similar to the first; but the girders are placed 3 ft. $7\frac{5}{8}$ in. apart, with, of course, a diminution in the dimensions of the cover-plates. The third row of girders is 6 in. less in depth, placed 1 ft. $11\frac{1}{4}$ in. apart. The top row of girders consists of a single one, 3 feet deep. The holder bracing is composed of flat bars.

The Three Lifts and Guide Rollers and Carriages.

It should have been mentioned before that in all particulars the structural details of the pair of holders are similar. Dealing with the lifts, the inner one is 273 ft. 9 in. diameter by 51 ft. deep; and the crown has a radius of 400 feet. The latter is constructed of a centre plate 8 ft. 2 in. diameter by $\frac{1}{2}$ inch thick; and the first course of plates is 9 feet long by $\frac{1}{4}$ inch thick. The succeeding seventeen courses are of No. 8 S.W.G.; while the nineteenth course is $\frac{5}{16}$ inch thick—the length of each plate being about 13 ft. $8\frac{3}{4}$ in. The twentieth course is $\frac{3}{8}$ inch thick; the length of each plate being about 14 ft. $2\frac{1}{2}$ in. The curb is formed of $\frac{3}{4}$-inch plates about 9 ft. $6\frac{5}{8}$ in. long, and 4 ft. 9 in. broad, bent to a radius of 2 ft. 3 in. The girder round the curb is composed of two plates, each 18 in. broad and $\frac{3}{8}$ inch thick, and two angles, each 4 in. by 4 in. by $\frac{1}{2}$ in., on the outer edge, and two similar angles on the inner edge. These are riveted to the $\frac{3}{4}$-inch curb plates. An angle, 6 in. by 4 in. by $\frac{1}{2}$ inch, rolled to suit the angle of the crown, is riveted to the $\frac{3}{8}$-inch course of plates, at a distance of about 5 ft. 9 in. from the edge of the holder. To this angle is attached a plate, 12 in. broad by $\frac{3}{8}$ inch thick, stiffened at its lower edge by an angle 3 in. by 3 in. by $\frac{3}{8}$ in. The gusset

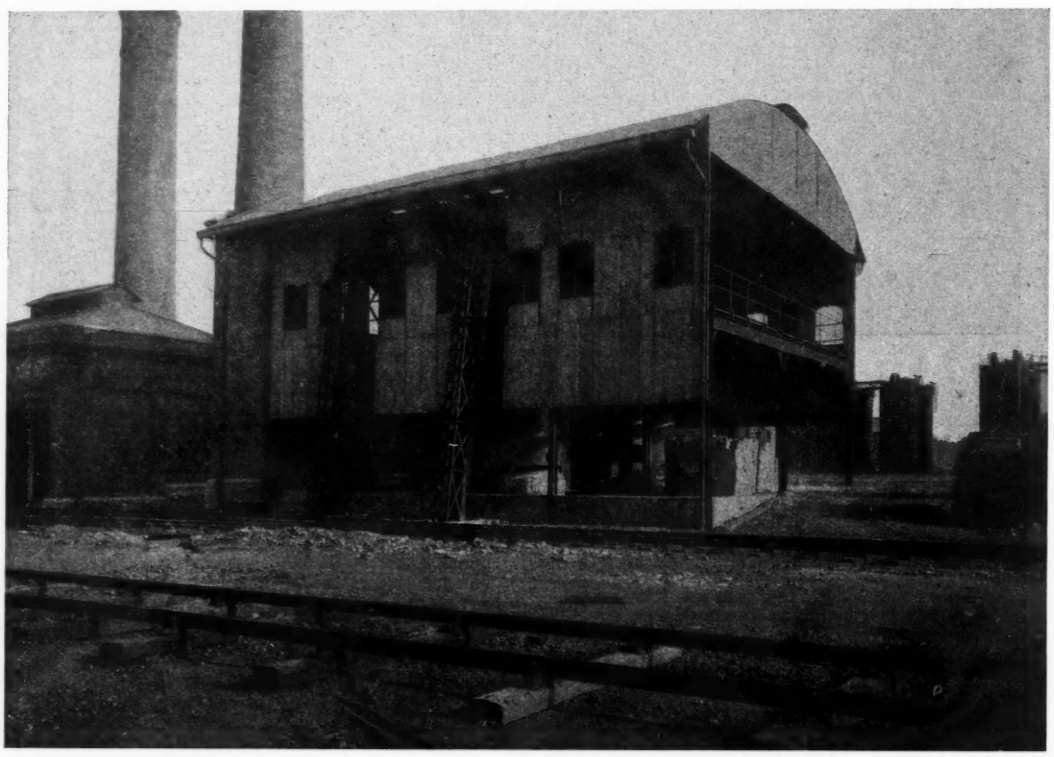


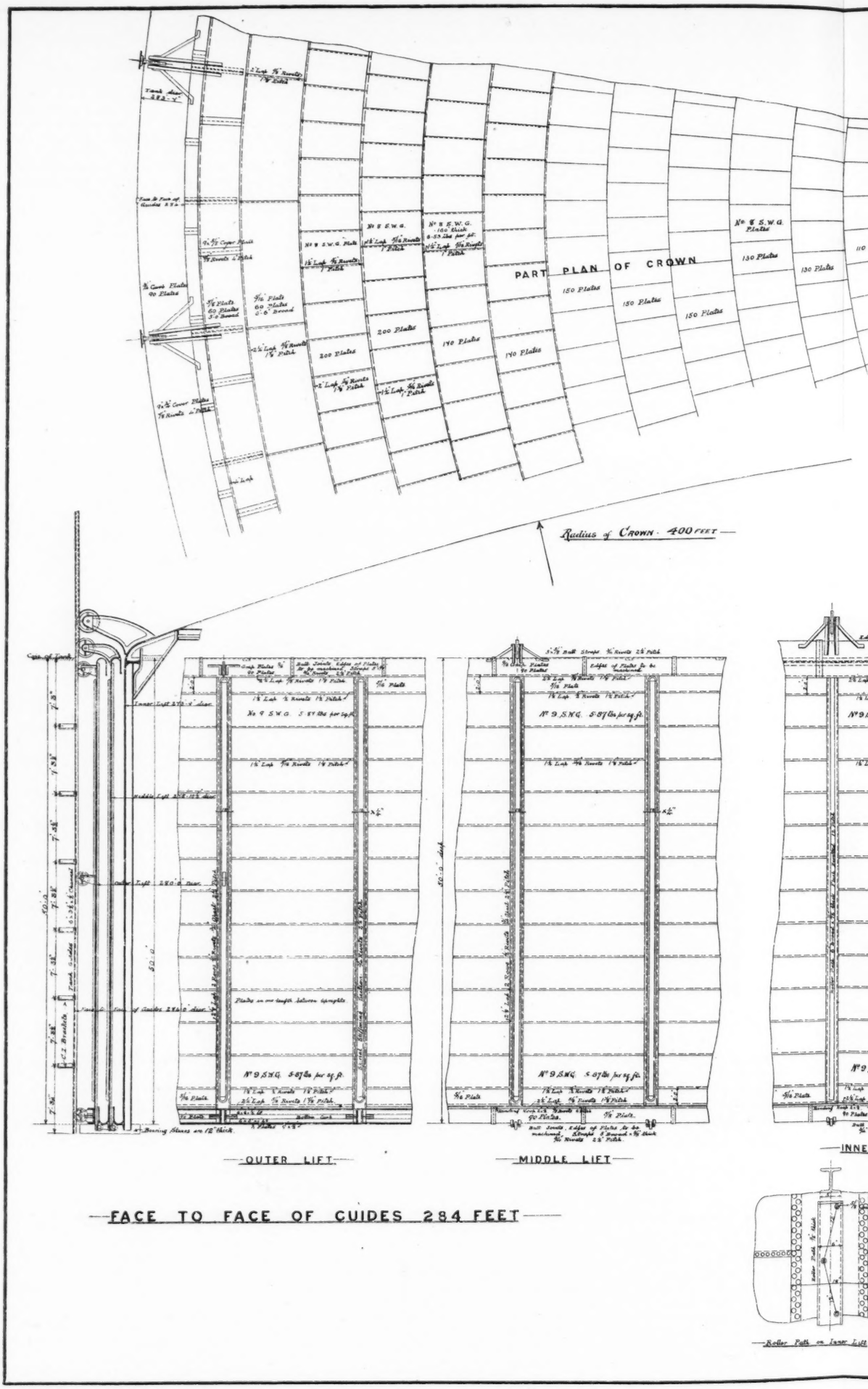
Fig. 33.—The Oil-Gas Plant.

stays, of which there are sixty, are of $\frac{3}{8}$-inch plate, and are secured to the curb plate and girder by two substantial angles, and to the beams of the sides by two other angles of lighter section. The inner edge of the $\frac{3}{8}$-inch plates are also strengthened by a couple of angles. There are four manhole doors in the crown. The sides of the lift are built up of sixty stiffening upright I beams, 10 in. by 5 in. and 50 ft. $2\frac{1}{2}$ in. long. To each of these is riveted a $\frac{1}{4}$-inch plate, 18 inches wide, and made in one plate in the length. The top and bottom courses of plates between these uprights are $\frac{5}{16}$ inch thick and 2 feet broad; and the twelve intermediate courses of plates are of No. 9 S.W.G. Each plate is about 13 ft. $2\frac{1}{4}$ in. long, and about 3 ft. $7\frac{3}{8}$ in. broad; there being only one plate in each row between the uprights. The cup is formed of $\frac{5}{8}$-inch plates, 9 ft. $7\frac{5}{8}$ in. long, and 4 ft. 6 in. wide; the cover-plates being 5 inches broad by $\frac{5}{8}$ inch thick. The plates are bent to form a cup 21 in. deep by 12 in. wide inside. The roller path opposite each standard consists of a plate 6 in. broad by $\frac{11}{16}$ in. thick, in a single length.

The middle lift is 276 ft. $10\frac{1}{2}$ in. diameter by 50 ft. deep. The cup is similar to that on the inner lift. The grip is formed of $\frac{5}{16}$-inch plates, about 9 ft. 8 in. long; the plates being bent to a width of 12 inches inside. A cast-steel bearing-block, 6 in. broad by $1\frac{1}{4}$ in. thick, is riveted to the centre of each plate; and a flat binding hoop, 2 in. by $\frac{1}{2}$ in., is riveted on the inner edge of the plate. The sides are constructed with sixty stiffening upright plates 18 in. broad by $\frac{1}{4}$ in. thick; but the courses of plates between are similar to those of the inner lift, with the one exception that they are, of course, slightly longer. The channel-guides are 6 in. by 3 in. by $\frac{1}{2}$ in., and 50 ft. $2\frac{1}{2}$ in. long in one length, having an angle-bar 3 in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. extending the full height, and carried $4\frac{1}{2}$ in. higher. Outside each of the $\frac{1}{4}$-inch upright plates is riveted a $\cap$-shaped stiffener, 11 in. broad by 3 in. deep, and $\frac{3}{8}$ inch thick, in one length.

The outer lift is 280 ft. diameter by 50 ft. deep. The bottom curb consists of two angles, 6 in. by 6 in. by $\frac{1}{2}$ in., and two plates, 9 in. broad by $\frac{1}{2}$ in. thick, riveted to each of the angles. The plates and angles are riveted together and to the bottom course of plates, with cover-plates, over each joint, overlapping so as to form a continuous ring round the holder. The grip is similar in all respects to that on the middle lift; the only difference being that the plates are 2 inches longer. The sides, too, are similar to those of the middle lift. The bottom course of plates is $\frac{3}{8}$ inch thick and 2 feet broad, and the top and the one next to the bottom course between the uprights are $\frac{5}{16}$ inch thick and 2 feet broad. The twelve intermediate courses are of the substance of those in the other lifts, but are slightly longer. The channel-guides and outside stiffeners are also like those on the middle lift.

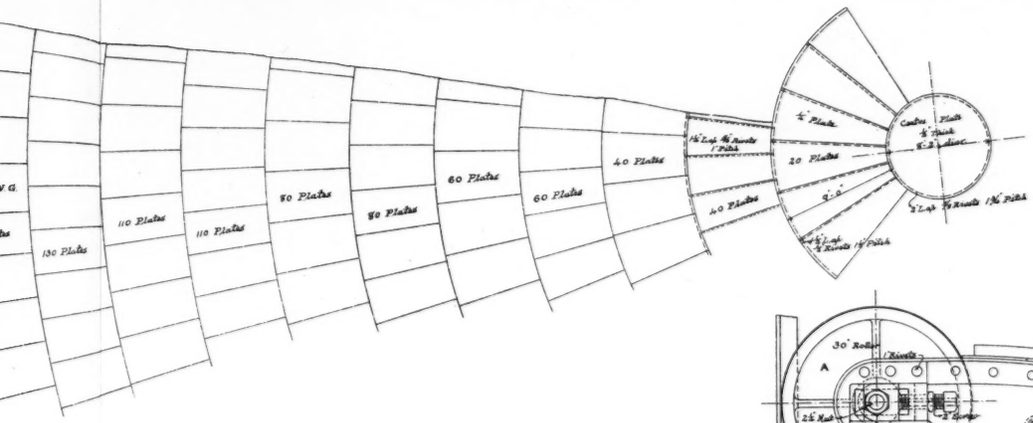
Now as to the guide rollers and carriages. Those (thirty in number) fitted to the curb of the inner lift are formed of two

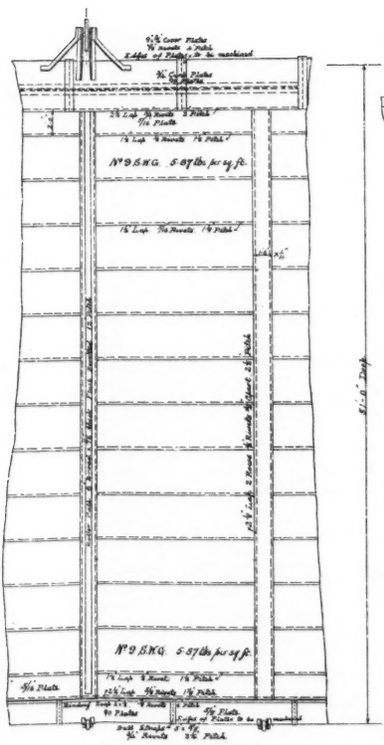

PART PLAN OF CROWN
Radius of Crown 400 FEET
OUTER LIFT
MIDDLE LIFT
INNE
FACE TO FACE OF GUIDES 284 FEET

GLASGOW CO

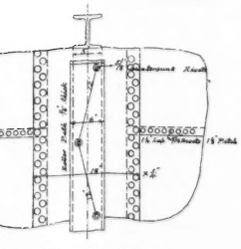
PROV

THREE

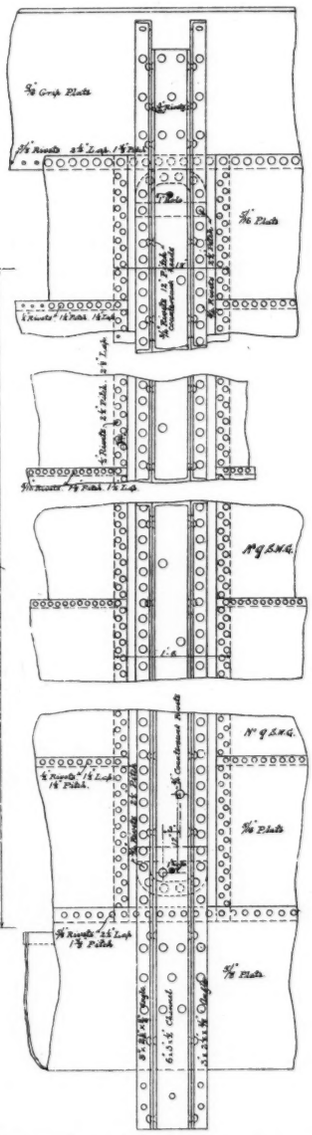




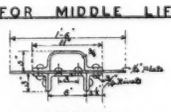
INNER LIFT



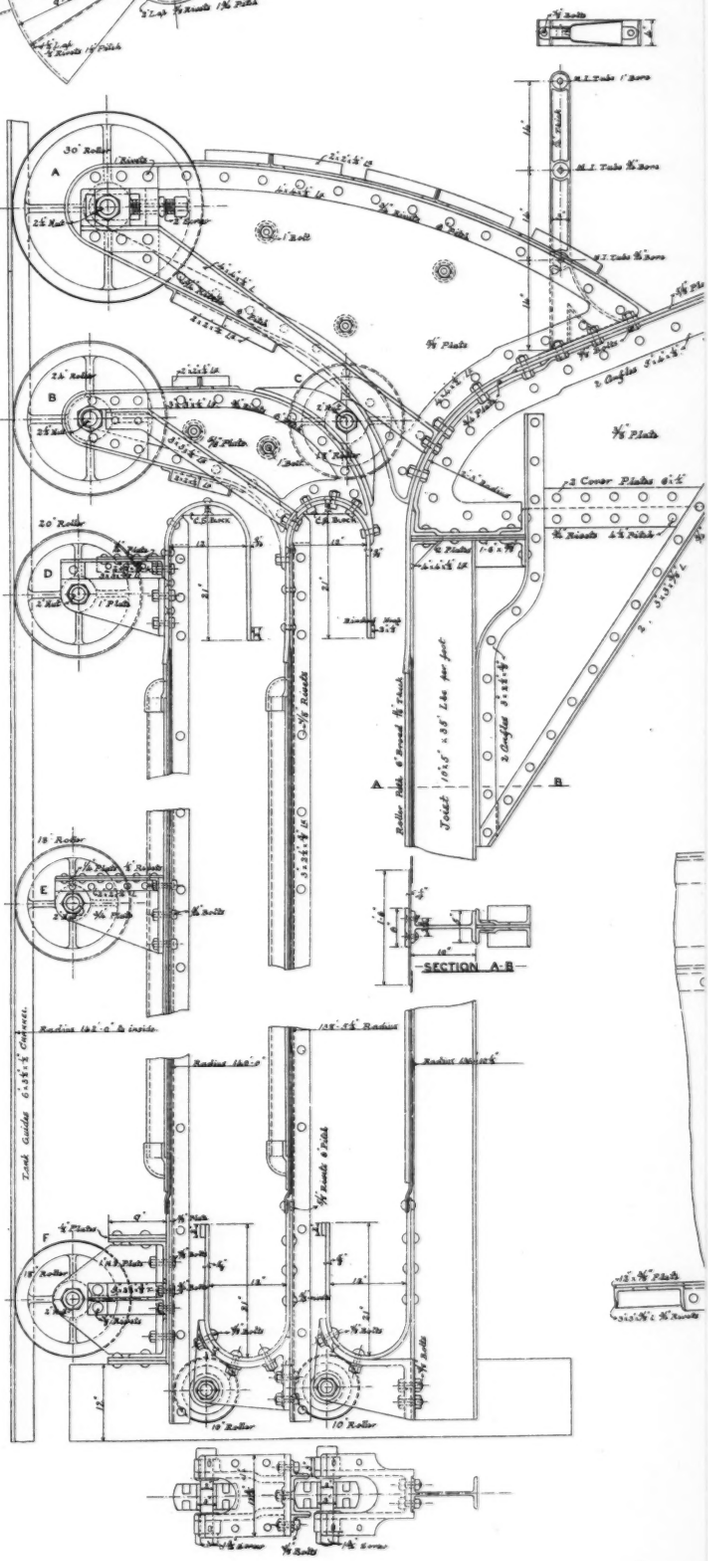
Roller Path on Inner Lift



STIFFENER FOR MIDDLE LIFT



SECTION



RATION GAS WORKS.—

N WORKS—

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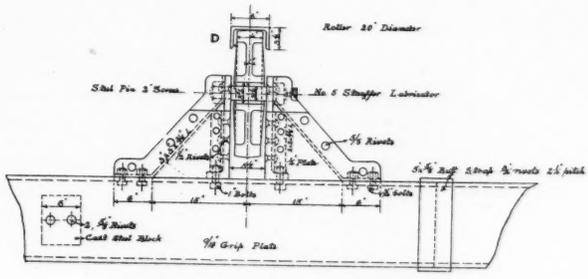
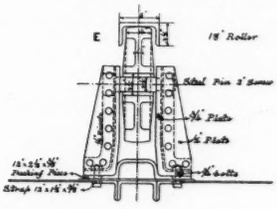
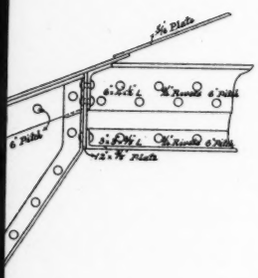
No. 7.

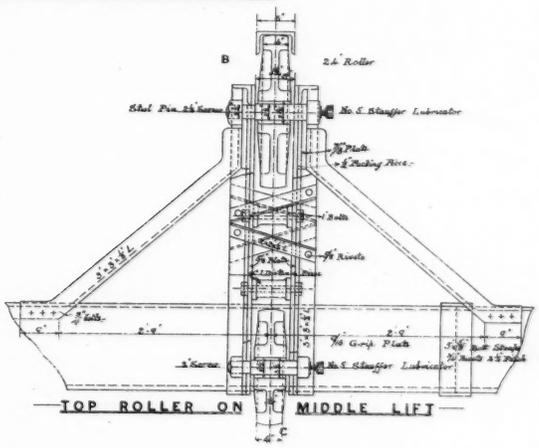


—TOP ROLLER ON OUTER LIFT—

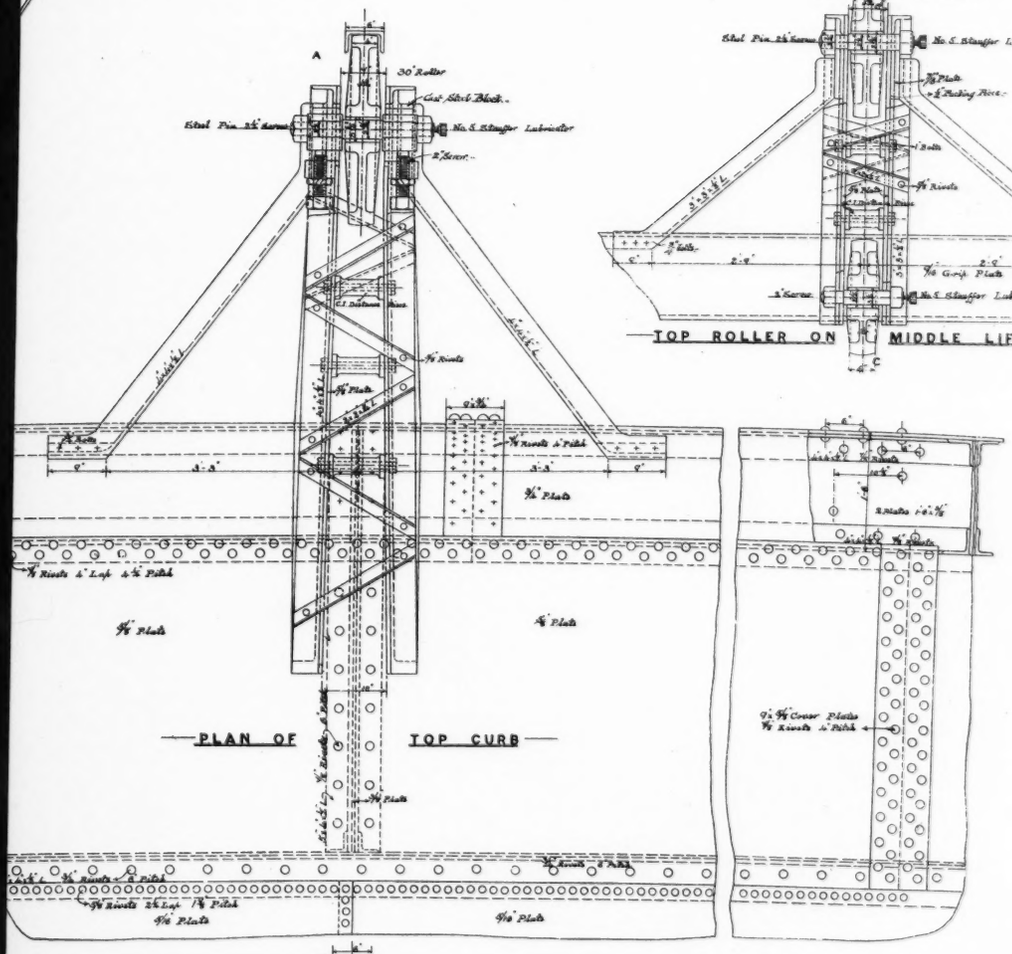


—MIDDLE ROLLER ON OUTER LIFT—

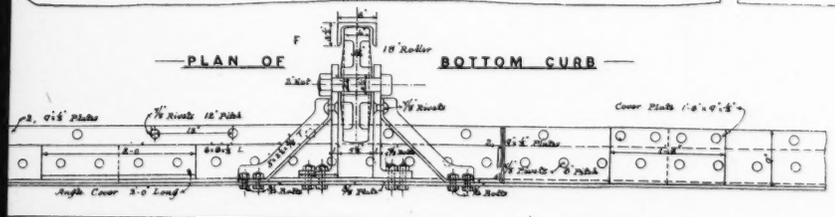




—TOP ROLLER ON MIDDLE LIFT—



—PLAN OF TOP CURB—



—PLAN OF BOTTOM CURB—

⅝-inch plates, strengthened with angles 4 in. by 4 in. by ½ in., welded into a frame and riveted to the plates; the plates being bolted together with three bolts, having cast-iron distance-pieces between. At the outer end of each plate forming the roller carriage, there is riveted a cast-steel block, having a centre slot into which a cast-steel sliding-block, carrying the roller, is fitted. The sliding-block is actuated by a 2-inch screwed pin provided with a back-nut. The carriages are stiffened sideways by two diagonals riveted to the side plates and bolted to the curb, and by angles riveted to the top and bottom. The rollers are of cast iron, 30 in. diameter and 4 in. broad, and are bushed with brass ½ inch thick. There are differences, but not great ones, in the construction of the roller-carriages bolted to the top grip of the middle lift and those bolted to the side of the grip of the outer lift. But in the case of the carriages on the middle lift, the outer roller is 24 inches diameter, and the inner one 18 inches; and in the carriages of the outer lift, the roller is 20 inches diameter. There are also an equal number of guide-roller carriages on the middle of the outer lift, with rollers 18 inches diameter. The sixty bottom roller-carriages on each of the inner and middle lifts (bolted to the cups and vertical I beams and channels) are of cast steel, with 10-inch rollers. Those on the bottom of the outer lift are bolted to the curb, and are formed of bent plates 1 inch thick, stiffened by a T bar; the roller being 18 inches diameter. For the purposes of lubricating the guide-roller carriages on the top of the inner, middle, and outer lifts, a $\frac{5}{16}$-inch hole is drilled in the centre of the pins, and a similar hole is formed at right angles thereto, with a gutter on the side of the pins next to the gasholder. A No. 5 iron Stauffer lubricator is screwed into the hole in the centre of the pin.

Inlets and Outlets, &c.

The inlet and outlet pipes are of steel, 42 inches internal diameter. On each is a cast-iron hand-pump, so arranged that it can be withdrawn for examination or repair without escape of gas, and a 42-inch double-faced flanged slide-valve, with a hand-wheel, 3 feet diameter. A ladder runs the whole height of the framing, and is connected with a platform on each row of girders. The ladder has a handrail on each side; and a handrail is also carried round the holder on the top of each row of girders.

Without going deeply into detail, the foregoing will acquaint readers with the chief structural features of these large holders.

Oil-Gas Plant and Enrichment.

We will conclude this third article with a description of, and a little explanation regarding, the oil-gas enrichment plant. As is well known by those who have interested themselves in the gas affairs of Glasgow, the Corporation supply gas of an illuminating power of rather more than 20 candles. But they have the statutory right to go down to 16 candles; and the time may be not far distant when they will dispense with enrichment, and supply a lower illuminating grade of gas. This accounts for the temporary character of the structure which houses the oil-gas plant at Provan. However, we have here to deal with the present, and not the possibilities of the future. At the Tradeston and Dalmarnock stations, it is learnt that oil-gas enrichment has not to be resorted to, seeing that the gas made there is of 20-candle power. But at the Dawsholm station and now at Provan, the coal gas is made of a less illuminating power; and therefore at these two works oil-gas enrichment is applied. This is preferred on the ground that the use of a greater proportion of cannel has a tendency to act detrimentally on the coke, as some of the cannel in the district gives nothing but a pure ash.

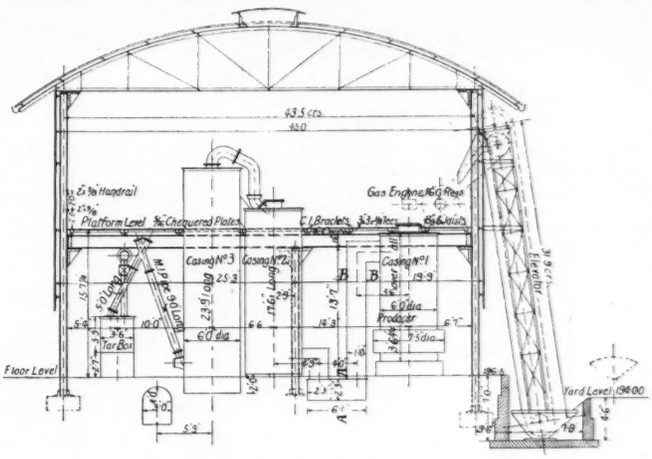


Fig. 34.—Cross Section of the Oil-Gas House.

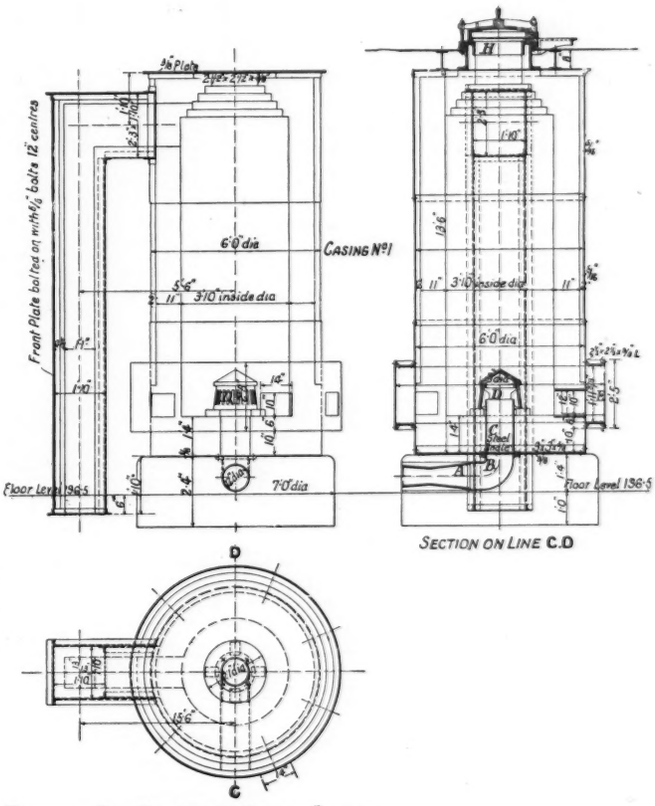


Fig. 35.—Gas-Producer Steel Casings for the Oil-Gas Plant.

[This illustration was given by inadvertence as fig. 10 in the "Journal" for Sept. 13.]

The new oil-gas plant at Provan is built in four units. Each set consists of two cast-iron (3 feet diameter) round retorts, with brickwork settings, surrounded by mild steel casings; and each pair of units is served with fuel gas from one producer for heating. A single unit is capable of making 2500 cubic feet of oil gas per hour, with an enrichment value of 112 candles. A Scotch gas oil is used, of a specific gravity of ·85. The oil gas is introduced into the coal-gas main before the exhausters are reached. The process of manufacturing the oil gas is briefly this: A pump is used for raising the oil, which is sprayed through a tube in the top of the centre of the first and shorter cast-iron retorts. In this retort (which is maintained at a higher temperature than the second one), the oil is converted into vapour, which then passes over into the second retort, where it is cracked up and converted into a permanent gas. The second retort is maintained at a considerably less temperature than the first. The oil on its way to the retorts is passed through a jacket round the gas outlet-pipe, so as to utilize some of the heat of the outgoing gas. The coke for charging the producers is elevated by a bucket conveyor.

This gives a general idea of the plant and system of working; but now we may present a few of the salient structural particulars of both house and plant. The former is 58 ft. 9 in. long by 45 ft. wide inside, covered by an overhanging bowstring roof, 59 ft. 3 in. long, and 52 ft. 2 in. wide, with a ventilator 8 feet wide running the full length. The house is built of four steel frames, each formed of two vertical rolled joists (cemented into cast-iron shoes bolted to the bearing-stones), spaced 42 ft. 8 in. apart, and connected at about their mid-height by a transverse rolled joint, with a vertical support at the middle. The four frames are placed at 15-feet centres, and are connected by eight horizontal H beams on the sides, and fourteen purlins on the roof, and braced by diagonal bars. The roof is also braced horizontally under the tie-bars by four flat bars. The building is covered with No. 16 B.W.G. galvanized corrugated sheeting, and contains several windows, glazed with ¼-inch rough cast glass.

Turning to the plant, the general features will be best gathered from the drawings and photographs (figs. 33 to 36). It will be seen that there was a considerable amount of steelwork involved in the installation, particularly in connection with the steel casings required for the producers and for surrounding the brickwork settings, and the flue and other connections. Two of the casings, it is remarked, are 6 feet diameter by 13 ft. 6 in. high; four others, of the same diameter, are 17 ft. 6 in., and a further four 23 ft. 9 in. high. Their purposes will also be seen by the illustrations. The casings and flue connections are joined up to two main flues, each 2 ft. 3 in. square inside, and 10 ft.

long. There are also four tar-boxes, each 3 ft. 6 in. inside diameter by 3 ft. 9 in. deep. Around the casings is constructed a platform 58 ft. 6 in. long and 42 ft. 8 in. broad, supported on steel columns and rolled steel joists, and covered with steel-chequered floor-plates. This is reached by an iron stairway. Regarding the elevators for raising the coke for feeding the producers, the framings are 31 ft. 9 in. long between the centres. The gearing was supplied by the Belt Chain Engineering Company. The boot consists of cast-iron side plates, with steel bottom plate; the width inside being 20 inches. The buckets are of malleable cast iron, placed on the chain 18 inches apart.

*** The next article will conclude the description of this first section of the Provan works.

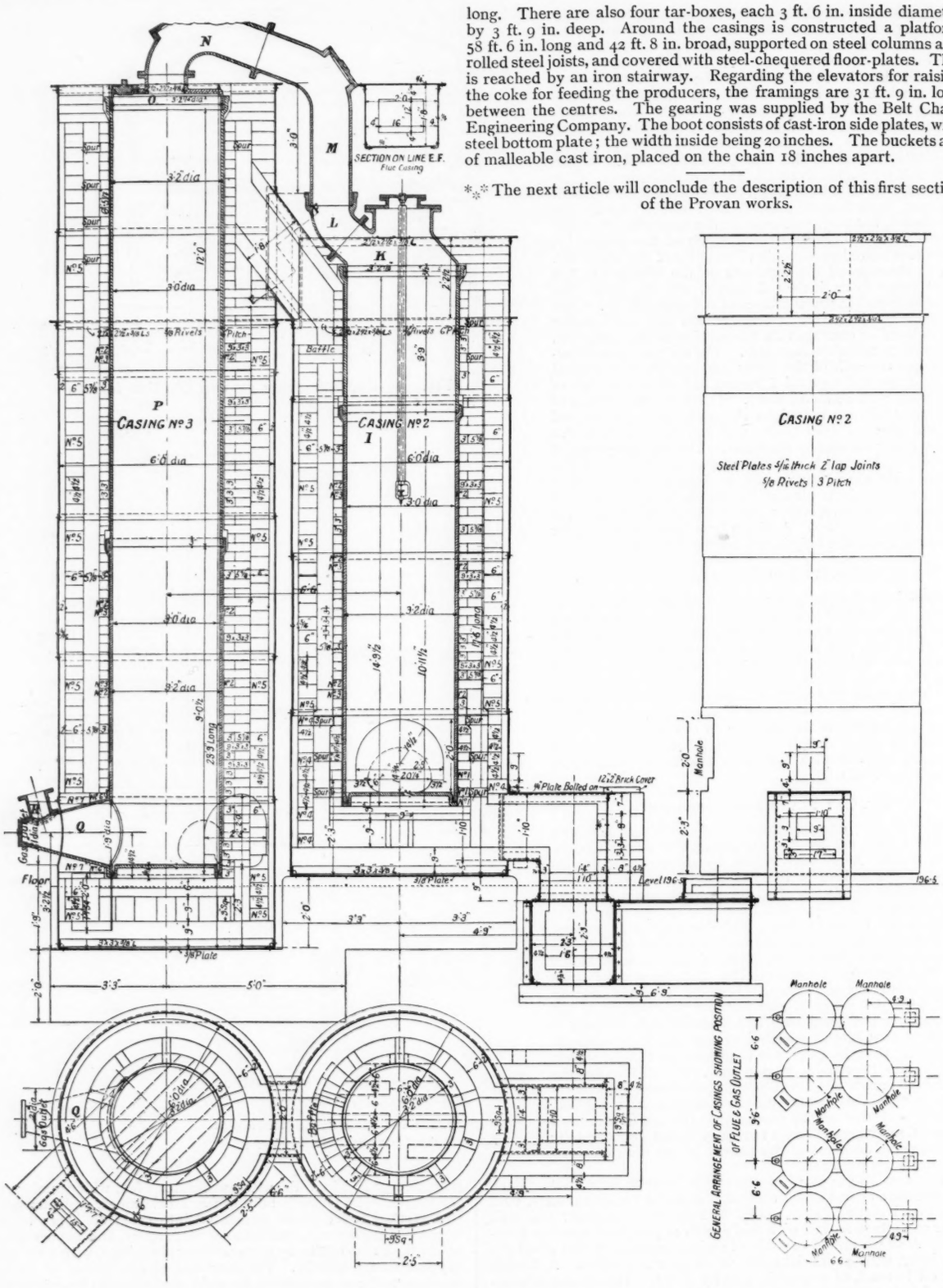


FIG. 36.—DETAILS OF THE OIL-GAS PLANT.

Test of Suction-Gas Plant and Engine.—In a recent issue of the "Zeitschrift" of the Society of German Engineers, Herr K. Bräuer considered in some detail the reactions taking place in a suction-gas generator, and applied the equations obtained to data furnished by the test of plant in the engineering works of Moritz Hille, near Dresden. The gas produced was used to drive an engine having a cylinder 13 inches in diameter and 18·1 inches stroke, and running at 200 revolutions per minute. The pressure of explosion was 455 lbs. per square inch; and the mechanical efficiency of the engine 80 per cent. at 31·68-horse power. From the results of the tests, the efficiency of the plant was found to be 85 per cent.; and calling the heating value of the gas passing out of the generator 100, this is utilized as follows: Heat equivalent of work indicated in cylinder, 29·8 per cent.; heat abstracted by cooling water, 37·2 per cent.; heat of exhaust gases, 30·2 per cent.; radiation and conduction, 2·8 per cent. The heat of the exhaust gases was determined by calculation as well as direct measurement, and the difference was only trifling. The fuel consumed in the generator per brake horse power developed by the engine per hour was 0·9 lb.; making the total efficiency 20·4 per cent. Comparing this performance with that of the steam-engine, Herr Bräuer stated that the coal consumption of the steam-engine of the same power as the gas-engine would be at least 1·87 lbs. per horse-power-hour.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

MEETING AT BOSTON, LINCS.

The Thirty-Second General Meeting of the Association was held at Boston last Thursday, under the presidency of Mr. J. STEWART DOUGALL, the Engineer and Manager of the Gas Company. The members, of whom there was a good number present, were received at the White Hart Hotel by the Chairman and Directors of the Gas Company, who entertained them to luncheon. The Chairman (Mr. William Pooles) presided; and the other Directors present were Mr. Tom Kitwood, Mr. James Eley, and Mr. John Shaw. The luncheon was well served. At its close, Mr. R. G. Shadbolt said he had a resolution to propose which he was sure would meet with a hearty reception at the hands of the members, and that was to move a vote of thanks to the Chairman and Directors of the Boston Gas Company for the hospitable manner in which they had entertained the Association. He could not help casting his mind back to two or three years ago, when the members were previously assembled in that room; and then the Chairman, in the fulness of his heart, said he hoped the time would be short when the Association would pay them another visit. The Association had kept their part of the compact; and the Chairman and Directors of the Company had well and faithfully kept theirs also. The motion was seconded by Mr. J. H. Troughton (Newmarket); and it was carried with great heartiness. In cordial terms, the Chairman acknowledged the vote, on behalf of himself and his colleagues. He thought the honours were equal, because he recognized that the great knowledge gained from the meetings of the Association was quite, if not more than, equal to any little courtesy extended to the members. It was a proud day for him and his co-Directors, seeing that the Association had selected the Company's Manager to be their President. He knew that in Mr. Dougall they would find one who had the interest of gas very much at heart.

After lunch, little time was lost; the members almost immediately proceeding to the works, which they inspected with much interest, although their last visit was as recent as April, 1902. They saw that Mr. Dougall has been busy with works renewals and repairs.

THE BUSINESS MEETING.

This was held in the Board-Room; and at the opening Mr. J. H. TROUGHTON (Newmarket), the retiring President, was in the chair.

The HON. SECRETARY (Mr. T. A. Guyatt, of Ely) first read the minutes of the last meeting; and they were confirmed.

ELECTION OF NEW MEMBERS.

Moved by the CHAIRMAN, and seconded by Mr. E. J. BROCKWAY (Cleethorpes), the following additions were made to the membership roll: As Members: Mr. John Holliday of the Sutton, Southcoates, and Drypool Gas Company, Hull; Mr. W. Shadbolt, of Horncastle; Mr. J. H. Brearley, of Longwood; and Mr. W. Orme, of Woodbridge. As an Associate Member: Mr. C. N. Brown, of the Southtown Gas-Works, Yarmouth.

THE EARL'S COURT EXHIBITION.

The CHAIRMAN remarked that the Committee had received a letter from the Hon. Secretary of the Institution of Gas Engineers with reference to the International Gas Exhibition. It appeared that it had occurred to the Advisory Committee that it might be well for the members of the Association to arrange a day—say, about the end of November—on which to meet as a body to view the exhibition. This was simply offered as a suggestion; and he would be glad to have the views of the members upon it.

The HON. SECRETARY having read the letter,

The CHAIRMAN (proceeding) said he thought the exhibition would afford a very favourable opportunity for members to gather together—and not only members of the Association, but their Chairmen, Directors, and Committeemen—to see the exhibition. He hoped the members would go back to their respective towns and urge their Directors, as far as possible, to contribute a sum sufficient, having regard to the size and capacity of their works, with the view of rendering the International Gas Exhibition worthy of the name adopted for it. A good many gas undertakings had subscribed; and many were buying tickets and distributing them among the householders in the towns in which they supplied. The Newmarket Company had decided to give every householder two tickets free. This was not a serious item, because the Company would only have to pay for the tickets used. In order to make the exhibition worthy of the great industry to which they all belonged, he asked the members to do all they possibly could to contribute to a thorough success.

Mr. SHADBOLT said there seemed to be some misunderstanding abroad with regard to this circular from the Hon. Secretary of the Institution. It appeared to be thought that the meeting should be a formal or technical one. Nothing, he believed, was wider of the mark. The idea, which was a laudable one, was simply this, that they of the Eastern Counties Association should have a date fixed on which to assemble at the exhibition, knowing that then they would meet those they were accustomed to meet at their ordinary meetings. He thought the date might be left to the Association Committee to determine; but there would be nothing to prevent members going up to the exhibition at any time that suited them.

Mr. WIMHURST proposed that a day during the second week of the exhibition should be arranged.

Mr. J. BROADHEAD (Great Grimsby) seconded the motion.

A vote was taken, and the proposal was carried; it being left to the Committee to arrange a date, and advise the members accordingly.

THE NEW AND RETIRING PRESIDENTS.

The CHAIRMAN said it was now his pleasure to induct his friend Mr. J. Stewart Dougall into the office of President for the ensuing year. He was sure their new President would worthily fill the position, and would do his level-best to uphold the prestige of the Association. When his year of office expired, he was certain that Mr. Dougall would be able to look back upon it with pleasure, because he (Mr. Troughton) knew that the members would support their President during the year with the same loyalty that they had supported their Presidents in the past.

Mr. DOUGALL met with a very hearty reception on taking the chair.

The PRESIDENT said his first duty was a pleasing and agreeable one. It was to propose a vote of thanks to the retiring President for the able way in which he had conducted the proceedings during the past year.

Mr. WIMHURST had great pleasure in seconding the motion. In Mr. Troughton they had had an ideal President, and his year of office had been a most pleasant one.

Very hearty endorsement by the members was accorded the resolution.

Mr. TROUGHTON, in reply, observed that he was grateful to the members for this second vote of thanks. He had already been thanked quite sufficiently for any little service or work he had been able to render to the Association. His year of office had been a delightful one. He had been well supported; and, if Mr. Dougall and his successors were supported in the same way, the Association would go on and prosper.

The PRESIDENT then delivered his

INAUGURAL ADDRESS.

Gentlemen,—Looking at our industry as a whole, I think we may congratulate ourselves at its continued prosperity. With so much depression around us in business generally, it is surely a time for us to rejoice that, in spite of all the competition we have had to contend with, prosperity has marked our path, and progress in no small measure has attended our efforts. If we refer to the last return made to Parliament, we shall see that the large sum of £113,000,000 has been invested in the authorized gas undertakings of the United Kingdom. This is sufficient to show the importance of the great industry to which we are proud to belong. It has made great strides in recent years, in face of the competition with the electric light, as may be instanced by the fact that while in 1883 there were 357 gas companies with an authorized share and loan capital of £48,000,000, in 1902 there were 454 with an authorized share and loan capital of £91,500,000. Further, in 1883 there were 148 local authorities supplying gas with an authorized capital of £21,000,000; and in 1902 there were 256 local authorities doing so with an authorized capital of nearly £42,000,000. These are figures which speak for themselves and mark progress to a remarkable degree.

Then, gentlemen, we must not forget that we are now in a stronger position than we have ever been before to make known the claims of gas, which has become a necessity of everyday life. We have a united Institution representing the gas industry. We, as a District Association, have become affiliated to it; and it should be our duty and privilege to do all in our power to help on the work of this National Institution. There is one way at the present moment in which we can all do something to strengthen the hands of the Council in their laudable endeavour to make known to the general public the claims of gas for lighting, cooking, heating, motive power, &c., and that is to support in every way possible the forthcoming International Gas Exhibition, to be held at Earl's Court during the coming winter. It is impossible for us individually to hold an exhibition in our respective districts on anything like the scale proposed at Earl's Court; but we can all do our best to bring the claims of the exhibition before our Directors and Committees, and enlist their sympathy and support to what bids fair to be a most useful, instructive, and interesting occasion. I believe that such an exhibition will encourage invention, and give an impetus to our industry; and that its influence will be felt in every town, and be a benefit to all. The contributions asked cannot be considered unreasonable; and I hope that our companies and corporations owning gas undertakings will, in these prosperous times for them, rise to the occasion and place sufficient funds at the disposal of the

Institution of Gas Engineers to enable them to make the exhibition a success in every way.

At no time in its history has our industry shown signs of greate vitality than at the present moment. The great absorbing problem of how to produce and sell "cheap gas" is one which is finding exponents in nearly every department of our manufacturing and distributing processes. With the demand for cheap gas comes the request to Parliament to reduce the illuminating power to a much lower standard than we have been accustomed to in the past, in order to meet the varied uses to which gas is now applied. We live in changeable times, and in the near future there is every reason to believe that great changes will take place in the processes of production as well as in the use of gas. With the advent of (say) 12-candle gas, properly tested, great economy would be effected. Most gas-works are now equipped with generator or regenerator furnaces, and the carbonizing can be readily pushed to any extent required. Modifications would be made in our mode of working in order to meet this new condition of affairs, but all would tend in one direction—namely, cheap gas. We have recently heard a good deal about the Settle-Padfield vertical retort system, which I believe claims an additional 3000 cubic feet to the ton of coal. That is indeed a great advance on our present working; and it behoves us to look closely into the matter, for a result so great must claim our serious and intelligent attention.

Such a result as I have stated only goes to prove that the possibilities of carbonization are not exhausted. In recent years much economy has been effected in the consumption of coke by the adoption of the generator and regenerator furnaces, with their attendant economy in the more scientific application of heat. But I venture to think that there is still much scope for increased production from the raw material we have to deal with. Let Parliament concede the lower standard of illuminating power, and recognize that what the public require is really a heating gas, then many inventive minds will set to work and possibly bring about radical changes in our working that shall considerably cheapen the cost of production.

The gas industry owes much just now to Sir George Livesey for what he has done, and is doing, to induce Parliament to reduce the standard of illuminating power, and to set gas free from unnecessary restrictions. A great change has come over the public requirements. We no longer need gas of a high illuminating power, and a degree of purity hitherto attained.

The figures published in the "Journal of Gas Lighting" in July last, giving the comparative consumption of gas by the South Metropolitan Gas Company, and the Crystal Palace District Gas Company, go to show conclusively that the reduction of 2 candles in the illuminating power of the former Company did not enlarge the percentage increase of consumption. This, I think, removes the most serious objection that can be advanced against a reduction in the standard of illuminating power.

We are often reminded by our candid friends of the great stimulus gas has received from the advent of the electric light. I am not going to minimize the importance of this; for I recognize that competition, whether in this or any other way, brings out the best qualities of our manhood. That it has done much for gas, I for one am free to admit; but that it has succeeded in providing for the general public a better and cheaper light, I emphatically deny. The many forms of incandescent gas lighting with which we are all familiar have out-run our competitor for supremacy, both as regards cost and effective lighting, as has been proved over and over again. There was at first a great rush for the "new" light. But in towns where the competition was greatest, a considerable reaction has already set in; and consumers are taking a more philosophic view of the matter, as many of you can testify. It is a significant fact that the last return of gas undertakings shows a considerable increase in the number of public lamps for street lighting. In several towns where the local authority own the electric light undertaking, and gas is supplied by a company—take Norwich, for instance—it is an encouraging fact that the incandescent gas light is preferred, and adopted for public lighting. The Metropolitan Boroughs have, with but few exceptions, adopted gas for public lighting. Victoria Station, London, which was, until January last, lighted by electric arc lamps, has now the incandescent gas system; and so we might go on giving instance after instance where gas is preferred to electricity.

Well, gentlemen, we must be thankful for this and take courage for the future. Although much has been done to render the incandescent burner effective as a means of illumination, there is still room for improvement in its adaptability to the requirements of our consumers. One of the great wants in the early days was convenient and artistic fittings; and although manufacturers have placed at our command a great variety of beautiful devices, there is still a call from our fastidious consumers for something more artistic still.

It is to be hoped that the prizes to be offered at the Earl's Court Exhibition will mark progress in this direction. I am convinced that, in time, we shall see much improvement in the way I have indicated, and that the convenience of switching the light on an off, which is so much appreciated by all those who use the electric light, will become general in the application of gas. Attempts have already been made in this direction with considerable success; and I look forward to the time when gas will be installed in our dwellings with all the facilities that belong to our rival the electric light. And while on this subject I must remind you that another direction in which improvement might be sought is in the automatic lighting and extinguishing of public lamps. I am aware that several contrivances have been placed on the market, with more or less success, but somehow they have not yet been received with general favour. It does seem to me a waste of energy and money to be obliged to send to each lamp at the time of lighting and extinguishing. At the same time, we must remember that, unless the apparatus is thoroughly reliable, the consequences might be serious.

I have so far spoken of the application of gas for lighting purposes; but this in many districts only constitutes about half the total output, and it is for the variety of other purposes for which gas is used, that the greater field remains for us to occupy. It is here that we feel the need of cheap gas. Then the convenience of gas for cooking, heating, &c., is a great consideration in its favour, and wherever it is installed for these purposes, it finds favour, and is retained. When we think of the innumerable ways in which gas can be applied in our factories, workshops, and in trade generally, we must realize the enormous possibilities that are still before us. The displacement of steam by gas as a motive power would cause a great revolution in our business; yet I believe that is not at all an improbability if only we can supply our commodity at the right price.

Great developments have taken place in gas-engines from time to time; and all our efforts are moving towards the production of cheap gas, an essential condition for motive power. In connection with the development of the gas-engine, it is interesting to note what that high authority Mr. Dugald Clerk said in a recent lecture on "Internal Combustion Motors." I will quote his own words: "The internal combustion motor offered, perhaps, the best instance of international industry which could be imagined. England stood at the head of all nations in the production of the smaller and medium-sized fixed gas-engines. She had produced altogether something approaching 100,000 engines of an average of 20-horse power, which was greatly in excess of the whole Continental output of engines of this type taken together. On the other hand, Continental engineers appear to have given more attention to the large gas-engine—engines of 500-horse power and above; and the application of blast-furnace gas to the use of the large engine. In this field of internal combustion motor work, Germany excelled. In the petrol motors for motor carriages, France appeared to take the lead; and in heavy oil-engines England led. In America, engineers were now giving considerable attention to the internal combustion motor; but so far, for some reason, the Americans had not shown in this subject the inventive and progressive spirit which they usually displayed."

Most of you, I presume, have now undertaken the maintenance of incandescent burners in some form or other. In some places the system has become a necessary part of the daily work of a gas company. Although the Company with which I am connected has not yet launched out on these progressive lines, I am hopeful some day we may do so. We must not, however, stop here; for it is surely necessary that every appliance for the use of gas should be periodically visited by competent fitters. This is the only way to give satisfaction, and by keeping in constant touch with our consumers we are ever on the alert for additions to our business. This progressive movement in pushing business can only be properly carried out by companies providing suitable show-rooms, and undertaking to supply, and to do, everything that their consumers require, so that the latter may turn instinctively to the gas company for whatever they need.

The growth of the Company with which I am connected will be seen from the following statement, since the adoption of the prepayment meter supply:—

Year.	Gas Sold.	Increased Sale.
1900 ..	52,530,400 ..	564,000
1901 ..	53,862,700 ..	1,332,300
1902 ..	56,278,400 ..	2,415,700
1903 ..	59,226,600 ..	2,928,200
1904 ..	66,354,700 ..	7,148,100

Slow, it is true, has been the progress in the past; but with the general adoption of the prepayment system of supply, the Company has considerable possibilities before it. Since the introduction of this system, the consumption has increased in a satisfactory manner; and last year the increase over the previous year was about 10¾ per cent. There is still a great deal to be done; for, although we have 2575 consumers, there are over 4900 inhabited houses in our district, 2325 of which are not using gas. These houses are inhabited by a class of people to meet the wants of whom the prepayment system has been specially devised; and we hope in time to number most of them among our consumers. I can see no reason why we should not some day have as many prepayment as ordinary consumers. The initial cost of installing the prepayment system is great; and the consumption per consumer varies considerably. In London and other places, I hear it averages about 20,000 cubic feet; whereas in some provincial towns it does not much exceed half that quantity. With such a great difference, it is manifest that the terms on which gas can be supplied must also vary. The extra rate over the charge to the ordinary consumer where the consumption is only say 10,000 cubic feet must be more than when 20,000 cubic feet are used. Parliament is ever on the alert for the protection of the smaller consumer, and in the case of the London Companies has fixed the extra charge at 10d. per 1000 cubic feet. In a provincial case

recently I think 1s. per 1000 feet was allowed. This has been considered a reasonable figure for these companies to charge. In districts where this class of consumer can be connected to existing mains, the addition is readily made; but when the acquisition means an extension of mains, some hesitation is often experienced. In Boston, we must lay new mains before we can supply gas to all the houses in our district; and that is a matter which must receive the attention of my Board. In these days of distributing gas at high pressures, however, the outlay on mains cannot be so great as formerly.

What has now come to be known as the Bermondsey Clause, by which the revenue of a municipal electrical undertaking is made to balance the expenditure without coming on the rates, is one that we should endeavour to have introduced into all such undertakings for our own protection, and as a check on extravagance in municipal trading. Gas companies are, as a rule, among the largest ratepayers in their districts; yet they have no voice in the spending of the money which they are called upon to contribute to the rates. It is a violation of the old principle of our constitution, that representation should go with taxation. Sir George Livesey, speaking on this subject, said that the gas companies had more justice on their side than the passive resisters who refused to pay the education rate; and he facetiously remarked that, if gas companies refused to pay the rates, the authorities might take away a gasholder or a purifier. I think that we might reasonably hope soon to see this injustice removed by the passing of the Bill introduced by Sir Albert Rollit—a Bill which provides that each company will have one vote.

And now, in conclusion, I desire to express the hope that, during the year upon which we have just entered, members will come forward with papers on interesting subjects, and that our Association will grow in usefulness in every way.

Mr. J. Carter (Lincoln) said the address which they had just listened to fulfilled one of the paramount necessities of an address from the chair. It was suggestive rather than exhaustive; and he proposed that they accord to their President their hearty thanks for it.

Mr. G. R. Casterton (Melton Mowbray) seconded the motion, which was carried with applause.

The President thanked the members, remarking that it had been a great pleasure to prepare and read the address.

Mr. F. Paternoster (Felixstowe) then read the following paper:

A FEW DIFFICULTIES ASSOCIATED WITH THE SUPPLY OF GAS TO A RAPIDLY INCREASING DISTRICT.

I do not claim that Felixstowe is an exceptional example of a rapidly increasing district, or that any of the difficulties encountered are of an extraordinary nature. Some of them, no doubt, are owing to purely local circumstances or are peculiar to a seaside resort.

I think I cannot do better, as a commencement to my paper, than give you a few particulars with regard to the growth of the town, and the business of the Company which I represent. The Company started making gas on Dec. 5, 1884, with 16 consumers; the price charged being 5s. 5d. per 1000 cubic feet for lighting and 3s. 6d. for gas-engines. By Dec. 31, 1885, the number of consumers had increased to 51; the gas sold to that date being about 730,000 cubic feet. For the year ended Dec. 31, 1903, the number of consumers on the Company's books totalled 565, and 218 public lamps; the quantity of gas made being 23,656,300 cubic feet—that actually sold, 20,143,600 cubic feet. The price was 4s. 3d. net per 1000 cubic feet for lighting, and 4s. net for gas-engines. The population of the town during the above period increased from about 2500 to 6600; the number of houses erected to the end of 1903 being 1532.

My appointment at Felixstowe dating only back to the commencement of the year 1901, I will confine myself more particularly to the three later years; and for that purpose I have prepared the following table:—

Year ending Dec. 31.	Gas Made. Cubic Feet.	Gas Sold. Cubic Feet.	Number of Consumers.	Population of Town.
1900	15,282,100	12,259,400	370	5815
1901	17,929,000	14,505,000	427	6194
1902	19,536,600	16,713,000	497	6400
1903	23,656,300	20,143,600	565	6600

A company supplying gas to a growing town is often burdened with a heavy expenditure on capital account; and I regret the Company I represent is no exception to that rule. A heavy capital account is, without doubt, one of the greatest of the difficulties that a small and growing concern can possibly have to contend with. In such a case, the price of gas is necessarily high, and the chances of our competitors are greatly increased. The capital employed per ton of coal carbonized is, however, decreasing satisfactorily. In 1901, it was as high as £11 5s. 3d; but this had been reduced to £9 1s. 11d. at the end of 1903. The price of gas during this period has been reduced from 4s. 7d. net per 1000 cubic feet for lighting and 4s. 3d. for gas-engines, to 4s. 3d. and 4s. respectively; accounts being invoiced at 3d. per 1000 cubic feet above these prices, which is allowed for prompt payment. My Directors have also decided to reduce from the 1st of October next to 3s. 11d. and 3s. 9d.

The expenditure on capital account needs careful consideration. During a year of extraordinary expenditure, there is a great temptation to debit this account with more than its fair proportion, in order to show a good "revenue balance." This may work all right for the present; but what of the future? Take, for instance, such a year in a company's history when the majority of the mains in the district need replacing with larger pipes, or when it is necessary to do other work the benefits of which will be felt in after years. If the company is not a very large or prosperous one, the revenue account would be crippled by the large sum chargeable to repairs. In such a case as this, I am of opinion that small companies can legitimately form a suspense account, a proportion of which can be debited to the revenue account in successive years. This plan was followed at Felixstowe in the year 1901, when a very large expenditure on mains was necessary; and I can assure you that this suspense account has proved of very great benefit to the Company.

When a gas-works is erected in a small village, probably no thought enters the minds of the promoters that a day may come when that village will be an important town. The works are erected to supply perhaps 3 million cubic feet of gas per annum. Mains are laid to cope with this consumption; but suddenly, it is found that the plant is incapable of meeting the demands of the district. The works are extended, and larger mains are laid; but for a time it is impossible to keep pace with the rapidly increasing population. The company loses favour with its consumers and the district council; complaints are frequent as to high price and bad supply; and then, most probably, an electric light company starts business and profits by the difficulties of the gas company. Under these circumstances, the capital account is necessarily inflated. Money has to be expended on plant much ahead of present requirements, and other plant is put into disuse before its time; and until the company's increase assumes a normal rate, the interest charges must be a fairly heavy item.

I will now deal more particularly with the works themselves. Referring to the retort-house, I would mention that we are troubled (as I believe many other small works are troubled) by the fact that it is impossible on occasions to keep the number of retorts which may be in use in full work. The make per mouthpiece, and the sale of coke per ton of coal carbonized, suffer in consequence. The make of gas per mouthpiece will vary, according to the demand, from as low as 4500 to 6500 cubic feet; and we have reached as high as 7000. With regard to coke, though we have sold over 9 cwt. per ton of coal carbonized, I look one day for better results. The cost of carbonizing under these circumstances cannot be low; and the retorts must naturally suffer from irregular working—thus materially increasing the cost of repairs.

The retort-house contains five beds, each of six retorts (22 in. by 16 in. by 10 ft.), direct fired. Until the present year, there were four beds only. It was, however, necessary to increase our carbonizing plant, so that we might have a margin in case of emergency. Another bed was, therefore, added. There is also an old retort-house, which it is intended to convert at some future date. At the present time, it is not needed. The expenditure necessary would be large, and we should possess manufacturing plant much beyond our possible needs for some years to come. The walls of this house must be raised, and a division wall between the house and coal-store removed. The building would then require a new roof; and it would also be necessary to build a new coal-store. On the other hand, by removing a wall dividing the two houses, we were enabled, at a comparatively small cost, to build an extra arch at the end of the existing bench.

In the year 1901, a large detached chimney-stack was causing trouble—principally owing to the condition of the land on which the works are built. It is almost impossible to obtain a good foundation. The chimney was removed, and a small one built on one end of the retort-bench. It was made as high and as large in area as was commensurate with safety; but it would not give sufficient draught to heat a further bed of retorts. I decided, therefore, to erect a steel tube at the other end of the bench. It is 20 feet high, and 2 ft. 3 in. internal diameter, and is made of $\frac{3}{8}$-inch metal. This is lined, 10 feet up from the stack, with a $4\frac{1}{2}$-inch fire-brick ring. It has given every satisfaction so far, and can certainly be recommended for cheapness, and in situations where weight is a consideration.

The consumption of gas at different periods of the year is, I think, sufficiently interesting to quote at this point. Taking, for example, the year 1903, the total quantity of gas sold was 20,143,600 cubic feet, of which 7,674,200 cubic feet was sold for the first half (ending June 30), and 12,469,400 cubic feet from that date to Dec. 31. A comparison of the September and December quarters shows that 6,156,800 cubic feet were sold in the first, and 6,312,600 cubic feet in the latter. The large proportion sold during the September quarter can be explained by the fact that Felixstowe is a holiday resort. The town during this period is full of visitors; and cooking by gas is the order of the day. The apparently small consumption during the early part of the year is accounted for by the absence of visitors, and the closing up of a large number of houses. At this time considerable difficulty is experienced in obtaining access to our meters; and naturally a good many meters and cookers are idle.

The town is situated on a cliff, and the gas-works on low marsh land about a mile away. The dock being also about a mile away

in the opposite direction to the town, most of the coal used is obtained by sea from the North; but owing to the position of the works the cost into store is higher than might be expected at a town situated on the sea coast.

Gas is supplied to about 18 miles of streets; the consumers working out at just over twenty to the mile. Practically all the streets and roads are lighted; some of our mains having only this latter consumption to deal with. Owing to the increase in the number of ordinary consumers, my Directors have so far considered it inadvisable to entertain the idea of a prepayment meter installation. Should they at some future date decide to cater for this class of consumer, I believe there will be a very fair demand.

A district such as Felixstowe presents great difficulties in the nature of unaccounted-for gas. My attention was early directed to the leakage; and when I found that, to obtain a pressure of just over 1-inch in the centre of the town during the hours of the heaviest demand, it was necessary to give 5 inches at the works, I suggested the advisability of immediately replacing the existing small mains with larger ones. About 1300 yards of 12-inch and 800 yards of 9-inch mains were laid—starting from the works and finishing in the principal street of the town. The best part of the old mains were used to connect up other districts. The immediate result was that it was possible to reduce the pressure at the works to a maximum of 3 inches, and a minimum of 1½ inches—obtaining the same pressures in the centre of the town, and giving the outlying districts a satisfactory supply.

I next turned my attention to the street-lamps, and by providing all the flat-flame burners with proper regulators, I believe another form of leakage was permanently cured.

In one low-lying district water was causing considerable trouble; three syphons on the main having to be pumped twice each day. I expected to find a considerable number of leaking joints; but, to my surprise, the pipes were in places almost eaten away, and even in apparently sound places the metal could be cut with an ordinary pen-knife. The foundation of the road consists of black mud; water rising and falling with the tide. When relaying the main, I had the bottom of the trench covered with brick rubbish and timber placed under the majority of the joints. The pipes were also well coated with tar.

The leakage account is not even now all that can be desired; but during the past three years it has been reduced from 16·2 to 9 per cent., and taking into consideration the nature of the district, I think we must be satisfied with a gradual improvement in this direction.

I intend devoting the majority of the latter part of my paper to the question of electric light competition. This is a difficulty which we all, more or less, have to contend with; and I trust that my little experience will prove of interest to you all. Very few of us are free from this competition; but rarely has a gas company's business suffered in consequence—the paraffin lamp being still our most serious competitor. There is not the slightest doubt but that the presence of the electric light in a town creates a demand for more and better lighting. I was fortunate enough a short time ago to induce a shopkeeper to discard the electric light, and return to the use of gas. Shortly after, I was congratulated by the Electrical Engineer, who stated that, though he regretted the loss of a consumer, he must admit that the standard of illumination was raised. Probably in no place is electricity so prominent as in a new and growing town—particularly a holiday resort where the visitors must have every luxury and (may or may not) be prepared to pay the cost.

The presence of electricity is very noticeable in Felixstowe. Builders will wire new property; some refusing to put in gas-piping at any cost. This tendency we have to fight, and with a fair amount of success, though cases are numerous where people would prefer to use gas and find that the house is not fitted. The landlord will not bear the cost, and even if the tenant were willing to do so, then most probably he is not allowed to disturb the walls and floors. The result is that the electric light is used in the house, or perhaps more often oil-lamps.

I once had a conversation with a builder who was erecting a row of new houses. He had decided that he would neither wire them for the electric light nor put in gas-piping, for if he did so the rent he must ask would in his opinion prove an obstacle to letting the property. Unless, therefore, the gas company were prepared to do the necessary work, free of charge, any tenant who required a supply of gas must pay the cost of the installation. Since then several applications have been received from tenants of these houses, and the needful outlay has lost more than one consumer.

The local Electricity Supply Company have been working for some years without a Provisional Order. Having no power to open roads, cables have been run overhead; wayleaves being obtained from private owners. In many cases, a free light has been given to the occupier of the property affected; the object, I presume, being that business would result.

Early in 1903, a promenade was constructed at Felixstowe; and, being at that time in the throes of a severe attack of electric light fever, nothing would please our District Council but that their sea-wall should be illuminated by the electric light. I was invited to prepare an elaborate scheme for lighting by gas; but having been informed by several members of the Lighting Committee that personally they felt it would be going back to a prehistoric age if gas were used, I was quite prepared for the ultimate decision of the Council.

A contract was entered into with the Electric Light Company; and they, no doubt with an eye to further business, persuaded the Council to agree that there should be no street lighting by any other means than electricity within 150 yards of any arc lamp on the promenade. At this juncture, the Council were considering the purchase of the undertaking; and it was agreed that the price charged for public lighting would be 3½d. per unit, while 8d. per unit was charged to private consumers.

I will not weary you with the purchase scheme here, but will refer those interested to the "JOURNAL OF GAS LIGHTING" of Sept. 29, 1903, which contains a full account of the Local Government Board inquiry. I cannot, however, depart from the subject without informing you of a remarkable sequel, which has only just come to light, and is a good example of the blindness of our local authorities where municipal trading is concerned. At a meeting of the District Council held on Aug. 4—nearly twelve months after the purchase was decided upon—a report was submitted by the Electricity Committee, which stated "that the abstract of the Company's title discloses that, in the conveyance of the land to them, the use of the land is restricted, and they have been advised that such restrictions very considerably affect the use of the site for the purpose of an electric generating station and that practically it cannot be used as such." The Council received the report, and decided to ask Counsel's opinion with regard to their position; and there the matter is left for the time being.

Referring to the previously mentioned agreement, the Council in due course gave the Gas Company notice to remove all street-lamps situated within 150 yards of the promenade; and I firmly believe that until the fact was pointed out by myself, they did not realize that this radius included all the principal streets of the town—another instance of blindness on the part of the Local Authority, but evidently not so on the part of the Electric Light Company. However, some arrangement was made with the latter Company, so that only 18 gas-lamps were removed; and a short time afterwards the Gas Company secured a 3½ years' contract for street-lighting.

Trouble arose from the inhabitants of one district where these lamps had been removed; and I have reasons for believing that it was intended to replace the lamps. But the Electric Light Company evidently stood in the way; and for reasons apparently only known to themselves, they have presented the town with a number of arc lamps placed at the opposite end of the streets to that affected by the dispute, and in close proximity to gas-lamps.

To meet such competition as the above, a gas company should, in my opinion, advertise freely. They should possess a good show-room in the centre of the town, where the advantages of gas, and the different uses to which it can be put, may be fully explained to the public; and the maintenance of incandescent burners by the company should be pushed for all it is worth.

Referring to the question of maintenance, and as a conclusion to my paper, I would like to refer you to the last Presidential Address of the Municipal Electrical Association, in which the President, Mr. T. P. Wilmshurst, referring to the maintenance of incandescent burners by gas companies, states that: "It is advisable to remember the great progress being made by our competitors, and it would be folly on our part to disregard their experience. Rather let us see if the methods they adopt cannot also be adopted with benefit to ourselves."

Discussion.

Mr. H. WIMHURST (Sleaford) said he sympathized very largely with Mr. Paternoster in the matter of his unaccounted-for gas; and he thought this was a direction in which he could look forward to making a still further reduction. Regarding the author's remarks about electric lighting, he might say that he had also very considerable sympathy with him in that respect. At Sleaford, they had an electric lighting concern carried on by the Council; and when he told the members that, during the last two years, it had been a charge upon the rates to the extent of over £1100, it would be seen that the Company he represented had no small amount of taxes to bear in that direction. They had, in other words, to bolster up the electric light undertaking; and they could not help themselves. It had been put about that the undertaking made a profit last year of £200; but taking the Council's own published statements for the last two years, they showed a deficit of £1100.

Mr. J. CARTER (Lincoln) said they were under an obligation to Mr. Paternoster for bringing this paper before the members. It was one of those productions which seemed to be extremely useful at meetings of an Association covering a district such as theirs. It occurred to him, when he first read the title, and saw that they were to have recounted the difficulties of a gas manager who had to serve a rapidly increasing district, that it would have been more natural if the paper had been on "A Few of the Difficulties Associated with the Supply of Gas to a Rapidly Decreasing District." In such a case the difficulties would have been much greater than where they had a constant and sensible addition to the number of consumers, even though this involved the requisite increase and extension of the manufacturing and distributing plant. One suggestive clause in the paper was where the author said the expenditure on capital account needed careful consideration. They could all of them appreciate that, during a year of extraordinary expenditure, there was a temptation to debit the capital account with more than was proper. All present could

also appreciate that it was sometimes a very convenient thing to debit the capital account, just for immediate purposes, with more than was a fair proportion of the cost of extensions carried out in any given year; and he did fully agree with the author that, having regard to the average life of gas undertakings, or for the matter of that of any industrial undertaking, it was a most fatal policy. Some years ago, he prepared a paper for the Ipswich meeting, in the course of which he had occasion to refer to the widely divergent charges per 1000 cubic feet of gas which were required to meet the cost of interest on capital and stock for companies and local authorities included within the limits of the Association. When he was inquiring into this matter, he himself was startled at the enormous differences—in one case (the lowest) the interest charges came to about 7d. per 1000 cubic feet of gas sold, while the highest reached the enormous figure of 1s. 9d. per 1000 cubic feet. Now, how seriously handicapped was the engineer who had to pay 1s. 9d. per 1000 cubic feet of gas sold in the way of dividend to his shareholders, or in interest and sinking fund charges if a corporation. One of the first and most important rules of a gas manager should be to keep the capital charges down to the lowest possible legitimate point, and to take care, even when the temptation was the strongest, to see that the expenditure on works and plant was fairly and properly proportioned between capital and revenue. This was a care that would amply repay every one of them as the years passed along. Another of the author's difficulties was that, with a make of 23½ million cubic feet, and the consequent short employment of some of his retorts during their active producing period, the sale of coke per ton of coal carbonized could not be raised above 9 cwt. per ton. He (Mr. Carter) was afraid that a good many of their friends had to be content with 9 cwt. of coke per ton of coal carbonized; and if Mr. Paternoster found the fullest employment for his retorts, he (Mr. Carter) ventured to think that he would find that he would not realize more than 10 per cent. above the 9 cwt. of coke per ton of coal. The author was fortunate in the circumstance that he had a summer sale of gas which was nearly equal to, if not slightly in excess of, his winter sale. This was a condition of things that ought to make his position rather easy, and ought to cause him look on the future with a considerable amount of complacency. It did not seem to him to be a thing to complain about in having reduced the leakage from 16·2 per cent. to 9 per cent.; and when the author had made the same proportionate reduction from the 9 per cent. as he had made between the 16 and the 9 per cent., he would have reached a position on which he could congratulate himself most completely. Regarding the electric light, it was really time that the gas engineers concerned mainly or indirectly about the progress of gas undertakings, should put their electric light friends in their proper position in relation to the gas industry. They were not competitors who were menacing their business, but they were friendly rivals, whose presence they should warmly welcome, because the inevitable result of their presence was a constant and very satisfactory increase not only in the manufacture of gas, but in the quantity of gas sold in the districts they served. With regard to street lighting, they had now got to the position where those who wished to be up-to-date should be well informed of the most recent developments in street lighting. It was not now correct to say that the electric light was an indispensable system. It was, however, right to say that ten years ago, the electric light might have been up-to-date; but owing to the enormous development made in incandescent gas lighting, electric lighting was now well out-of-date. Those who wished to be up-to-date should recognize this.

Mr. W. W. Hutchinson (Barnsley) was invited to speak, but said there was really little left to remark upon. There was one thing that had given him great pleasure, and that was to see a young member of the Association so warmly welcomed in coming forward with a paper. It was a very good feature in any Association where the efforts of a young member were honestly appreciated, and were commented upon in a really friendly way. Mr. Carter had just referred to the electric light; and he quite agreed with his remarks. They were going through the same experiences at Barnsley. The Corporation there had the electric light works under their own control; and so, of course, they did not want the incandescent gas-light. That was the long and short of it, although it was true the Gas Company could give a much more efficient, and steadier and more reliable light than electricity, and at a less cost. But the Gas Company's light was not required. This was the great difficulty they had to get over in the conduct of the competition of electricity for street lighting. Besides, in addition to losing the business, they had, as a Gas Company, to pay the increased rate for street lighting, and in many cases had to contribute towards the provision of funds to make good deficiencies of the electric light department.

Mr. Wimhurst mentioned that in Sleaford they had not now a single gas-lamp in the streets—the lighting was all electric.

Mr. R. G. Shadbolt (Grantham) said he also was struck with the title of the paper. It brought to his mind a conversation he had with an old and esteemed gas engineer on the Lancashire coast, whose output for years increased very rapidly. He complained of the strenuous life he was called upon to live, to keep pace with the demands thrust upon him. Another member of the gas engineering profession who was in their company at the time made the remark: "Yes, but there is another side to the shield. We are not all in the same position. Yours is a strenuous life I quite admit, but what about the man who has not only to cultivate and develop, but to force a consumption, whereby he can keep pace with the financial requirements of the undertaking?" If Mr. Paternoster had been placed in that position where he had to *force* a consumption, his paper would have been more useful for the members of the Eastern Counties Association. They congratulated Mr. Paternoster upon having had to deal with an increase of 20 to 25 per cent., and other considerable increases for several years in succession. Having to fight his way clear of all the surrounding technical difficulties appeared to be all the difficulty that these increases had caused the author. The results of what he had done had been good. As to the electric light, he thought Mr. Paternoster had paid too much attention to his opponents. They were all apt to do this just at first. But this—like water—would naturally find its level; and they would not then treat the electric light people exactly as competitors or rivals, but as colleagues, who had a right to a place, so long as they kept it. But when they began to encroach upon the domain of gas people, the latter naturally began to cry out. He must say their electrical friends were keeping their place better now. They saw the gas people were awake and alive; and not only so, but (as was seen in the last paragraph of the paper) were able to set them an example which it was worth while following. There was "life in the old dog" yet, and a great success in store.

Mr. W. D. Child said, in the second paragraph of the paper, Mr. Paternoster spoke of the prices charged for gas supplied to gas-engines. It was a surprise to him, and he could not understand, why a company who originally determined to sell gas for engine purposes at 3s. 6d. per 1000 cubic feet when they were charging 5s. 5d. for lighting, should afterwards adopt such a retrograde step as to raise the price of gas for power purposes to 4s. when they were reducing the price for lighting. He (Mr. Child) would be glad if Mr. Paternoster would give the reason for the adoption of this step. The author also referred to the difficulty of persuading builders to fit up houses either with gas-pipes or wiring for electricity. In his own case, he had also felt the same difficulty; and his Directors had endeavoured to meet it by agreeing to lay services to all consumers free of cost up to the meter, to fix meters free, and to put all pipes in houses while in course of erection at absolutely cost price. Even this had not induced the builders to do what the Company would like—that was, to see that every house was fitted with gas. It filled him with surprise and wonderment that the builders did not help the gas companies more than they did now, because, when the tenants got into their houses, they would have gas, and then the gas companies had to supply the pipes. He thought this was a point that might be put to large capitalists and builders who were covering increasing districts, that it would pay them better to put pipes in, when building, at a lower rate than the gas companies could do the work for afterwards.

Mr. Troughton congratulated Mr. Paternoster on his laudable efforts in attempting to get down the capital. He appeared to have had what most of them would consider to be the rather heavy capital per ton of coal carbonized of £11 5s. 3d., which he had succeeded in getting down to £9 1s. 11d. in three years. This was a good step in the right direction. Then the author went on to say that he considered it was quite legitimate to form a suspense account. Well, he (Mr. Troughton) did not see how one could be done without at a place like Felixstowe, where the capital was rising and the business was increasing so rapidly. It seemed to him they must form some such account to spread the heavy expenditure of one year over several. Then it appeared that Mr. Paternoster had not yet commenced the prepayment system. This, it seemed to him (Mr. Troughton), would be one of the remedies for the piping difficulty. It would also do away largely with his paraffin lamp competition; and he should strongly advise the Company to take it up, especially in a growing place like Felixstowe. Regarding the opposition of the electric light, he saw that the electric lighting people had put up several arc lamps free of cost; but the author did not say a single word about topping the electric lamps with incandescent gas-lamps. He (Mr. Troughton) would put up as many as they did, and supply them at the same "rate." He would not be beaten by any electric light company. If they gave one lamp, he would give two.

Mr. J. H. Sheldrake expressed the opinion that the author ought to fight the electric light a little bit stronger; and for this purpose there were systems of incandescent gas lighting which were much more effective than electric arc lamps.

Mr. J. Barton (Peterborough) congratulated both the author of the paper and his Directors on the course they had taken with regard to the suspense account. Many companies had suffered by an inflated capital account, and once they got the capital up to a certain figure, it was a very difficult matter to reduce it again. If they began right, by placing all expenditure that really did not belong to capital account to a suspense account, it was the correct thing to do. Keeping down the capital account was the salvation of any gas company. He also congratulated the author upon his proposal as to opening a showroom. This would be found to be a most useful addition; and one that would be much appreciated by the gas consumers generally. Not only would it be a source of profit to the Company, but it would be a great convenience to the consumers. He had found it to be so at Peterborough; and he did not know what they would now do without it.

Mr. C. F. Ruggles (Leighton Buzzard) asked to be allowed to say how pleased he was to see Mr. Paternoster before the Association reading a paper. Mr. Barton had spoken of the value of a suspense account. He (Mr. Ruggles) had also found it a wise thing to have. Some ten years ago his own Company had a heavy expenditure to meet; and they placed it to a suspense account. For five years they added to it, and did not interfere with the capital account at all. He endeavoured to keep their capital account closed, with the result that they were now making 43 million cubic feet of gas, and the capital was only £19,000. Only a short time ago, through the suspense account, they were able to spend £500 on mains without adding to capital, so that the account was a very valuable thing for them.

Mr. E. G. Smithard (King's Lynn) said, with regard to electric lighting competition, they must not lose sight of the fact that it was not so much the electric light they had to fight as the municipal authorities. The gas companies could show them that they could give a better article at less money than they could do it for themselves; but to get them to encourage local enterprise against themselves was altogether another thing. Where the electrical interests were in the hands of a company, it was quite a different matter, because it was then a question of "the survival of the fittest;" whereas where the supply was in the hands of the municipal authorities, they did not care whether or not the gas company could give a better article for the money—they simply would not have it. With electricity at 8d. per unit for private consumers, Mr. Paternoster need not be afraid the public would go very far into it, especially if they gave gas the credit for the additional illuminating power that could be obtained for less money. Where, however, a gas company had to fight electric lighting rates as low as 2½d. for street lighting, and 4½d. for private consumers, it made a great deal of difference to the eventual settlement of the question.

Mr. Paternoster, in reply, said Mr. Carter had made one or two remarks about electric lighting not being a difficulty; but, as Mr. Smithard said, this all depended upon whom the concern belonged to—whether the local authority or a private company. Mr. Shadbolt said they might consider the electric light people as their friends and not enemies, so long as they did not encroach upon their domains. As they did so encroach at Felixstowe, they could not at the moment consider them as their friends. Mr. Child referred to the price of gas for engines. The only reply to this was that Felixstowe was not a manufacturing town. It was a health resort; and there was no demand there for gas-engines, or for gas for power purposes at all. Mr. Troughton seemed to be under the impression that there were not many incandescent gas-burners in the streets of Felixstowe. As a matter of fact, the Company were not beaten by the electric light. There were incandescent gas-lamps close to these electric arc lamps; and all the gas-lamps in the place were fitted with incandescent burners. The Company also had a show-room in the town.

The President said the paper had elicited an excellent discussion. He emphasized what Mr. Hutchinson had said, and hoped that Mr. Paternoster's example would be followed by many other of the younger members in the future. In conclusion, he moved a vote of thanks to Mr. Paternoster.

Mr. Wimhurst seconded the motion, which was at once carried unanimously.

The Spring Meeting.

In the course of a conversation on this matter, it was mentioned that there was a suggestion that the spring meeting should be held at Leighton Buzzard; but, before any determination could be arrived at, Mr. Ruggles desired to consult his Directors. The matter was therefore left to the Committee for settlement.

This concluded the business meeting.

The New Municipal Buildings.

On the invitation of the Mayor (who unfortunately was detained in Sheffield on business), the members subsequently visited the new municipal buildings, which have been erected at a cost little short of £20,000. They are magnificent in their architectural features, and replete in their conveniences for centralizing the work of a thriving and progressive town. Before leaving, refreshments were served in the Mayor's parlour; and a resolution was passed thanking his Worship for his courtesy.

The Dinner.

The dinner was held at the Assembly Rooms in the evening; the President being in the chair. On his right and left were the Chairman and Directors of the Gas Company, and other prominent local gentlemen. The musical programme was good; and the toast-list a full one—containing no less than eight items. Thorough enjoyment permeated the proceedings.

We have received Part V. of the "Technological and Scientific Dictionary," which is being published by George Newnes, Limited. It extends from "Glass" to "Iron Compounds," and consequently includes articles on hydrocarbons, hydrogen, hygrometers, ignition, indicator diagrams, &c. Illumination, having been dealt with under the heading of "Artificial Illumination," is only briefly referred to; while incandescent gas-light is left for treatment under "Mantles."

ACTION OF CARBURETTING AGENTS IN GAS UPON DRY METERS.

The essential portion of the report presented at the last meeting of the German Association of Gas and Water Engineers by the Meter Commission (given in the "Journal für Gasbeleuchtung") consisted of a paper written by Dr. R. Witzeck, who was instructed to investigate the causes of the complaints which have become frequent of late about the behaviour of dry meters.

When these meters were first introduced, they were constructed with leather bellows; but soon afterwards certain real or imaginary defects were ascribed to that material, and new meters were placed on the market in which the bellows were made of a textile fabric impregnated in a particular manner in order to render the material impervious to gas. With the object of effecting "improvements," alterations in the nature of the original fabric, or changes in the method of preparing it, were tried; and the present position of affairs is that a constantly increasing number of gas-works are experiencing trouble with their dry meters, while some have reverted to the use of wet meters. The usual complaint about these dry meters fitted with textile bellows is that the lights jump, that the meters groan, that they become slow, that the loss of pressure is excessive, and sometimes that they refuse to register altogether. Frequently, however, suspicion is only cast upon them because the apparent consumption of gas has fallen off; and not until they have been disconnected and examined has any internal injury been discovered. Complaints have been made by several gas-works that the internal metallic portions of dry meters have actually been corroded. This, however, demands further inquiry; for in none of the old meters examined by Dr. Witzeck has the metal been found in anything but perfect condition.

Although the precise process employed in preparing the fabrics for use in meter bellows is secret, there is manifestly a fundamental difference between bellows constructed of leather and those of textile material. The leather is treated with a non-drying oil to render and keep it supple; and should this oil be removed from any cause, the leather can only become somewhat harder—it will still remain impervious to gas, except for the negligible quantity which passes through by mere diffusion. The fabric, on the other hand, is dressed with a drying (linseed) oil and graphite; and when the coating is removed, only a highly permeable material is left. It has been urged against leather that the ordinary "impurities" of the gas make it brittle, whereas suitably treated fabric is more resistant. But the only "impurity" which can act in this fashion is ammonia; and if sufficient is present to harm leather, it will destroy any fabric, or act upon the metallic parts of a meter, dry or wet.

Dr. Witzeck's investigations were pursued upon gas-meters obtained from Mannheim and Frankfurt—two towns of special interest in the present connection, because the latter supplies a cannel gas rich in heavy hydrocarbons, while at Mannheim some of the gas is carburetted and some not. As already mentioned, the metal in these meters was found quite clean and free from any corrosion. A few were seen in which the levers appeared to have been attacked; but on investigation it was discovered that the roughness was due to imperfect mixing of the two metals—tin and antimony—when the alloy was cast. The meters with leather bellows were, as a rule, in better condition than those with textile bellows; some leather bellows being 21, 25, and 29 years old, but many well preserved textile bellows 20 years old were met with. The injured fabric bellows had invariably lost their original grey (graphite) colour and the oil with which they had been impregnated; they were yellowish by transmitted light, and showed open pores at the upper parts. Lower down they were covered with a brownish, sticky layer, which caused the fabric to adhere to the metal, hindering the movement of the mechanism. As the gas which the meters had been passing contained the more heavy hydrocarbons, so a larger quantity of this sticky material was found deposited upon the surfaces of the slides. In the hollows of the metal work, there was a blackish dust; and when any paint was left, it had become dull in appearance, giving a black powder to the finger. In a very few cases there were white and yellowish dust and particles outside the measuring chambers and in the lead tubes.

It had been stated on behalf of the meter-makers that the meters were injured by the use of unsuitable carburetting agents, which had attacked the bellows chemically, or had carried forward gritty matter from the preservative paint inside the mains; or, alternatively, that the oxygen of the air admitted for purposes of purification had done the mischief. The latter assertions are clearly disproved by the examination of the meters; and as regards the first, when gas is enriched by means of benzol, xylol, &c., substances are only added to it which are already therein. When a petroleum product is employed, a hydrocarbon of different chemical nature is introduced; but so far as any action upon the bellows is concerned, the physical effect of a paraffin is identical with that of an aromatic hydrocarbon. In fact, there can be no doubt that ammonia, cyanogen, carbon dioxide, oxygen, and sulphur compounds have nothing to do with the destruction of the bellows; the real cause being simply a condensation of liquid matter upon them, which is the more copious as the gas is

richer in heavy hydrocarbons, and as their boiling points are the more elevated.

Dr. Witzeck's Experiments.

Strips were cut from the bellows of new and old dry meters and soaked for several days or hours in such liquids as benzol, xylol, spirit, a condensed product from gas, and the preparation known as "anti-naphthalene.*" The action of each upon a strip of given composition was identical; leather remained gas-tight and supple after treatment, but the fabrics were rendered yellowish in colour, owing to the removal of graphite, and became at first sticky, afterwards dry and porous. Soaked in aqueous ammonia, the fabric became porous, the leather stiff and brittle. Similar strips were exposed to currents of gas heavily loaded in one case with benzol, in the other case with xylol vapour. The fabrics treated with the benzol were but slightly affected; only a little moistening and subsequent brittleness being noticed. But those submitted to the xylol vapour were much more injured; the result being similar to that produced by the liquid.

In the next series of experiments, a gas supply containing from 3·5 to 4 per cent. of heavy hydrocarbons (about 0·7 per cent. of benzol) was led through an experimental meter into a carburetting vessel charged with either benzol or xylol, and then through a tube containing the strips of bellows material under investigation. Being weighed before and after each test, the carburettor showed how much liquid was introduced into the gas, from which the corresponding percentage by volume of vapour could be calculated. During the experiment, it was submerged in a water-bath and constantly agitated in order to prevent a fall in temperature so far as possible; but nevertheless the figures showed that the gas never became saturated with vapour at the temperature of the test. The first sample of gas was loaded with such a quantity of benzol vapour at a temperature of 17° C. that, according to the tables, it should be saturated therewith at 7° C. It was led over the test strips and simultaneously cooled at 12° C. It produced very little effect; but the fabrics became slightly crisp to the touch, and a little damp with water. A specimen of xylol was next prepared by rectification, and was found to contain practically nothing but the three isomeric xylenes. The second sample of gas (about 6 cubic feet in quantity) was loaded with benzol till it should have been saturated at 0°. This was led over the strips and cooled through a few degrees, but produced no effect. It was next loaded with the xylol till it should have been saturated at − 25°, and was led over the strips at a temperature falling from + 17° to + 12° C. The fabrics became very sticky; and after the drops of condensed matter were wiped off, distinct pores were seen in the material. Here a condensation of xylol took place at a temperature of + 12° from a gas, which, according to the vapour tension, should not have occurred above − 25° C. A third sample of gas (about 13 cubic feet), dried over calcium chloride, was saturated with xylol as for a temperature of − 2°, and was cooled sharply in an empty vessel from + 18° to + 13° C. Such a quantity of liquid condensed that the residual gas only retained sufficient xylol to saturate it theoretically for a temperature of − 17°; but on leading it over the strips in the manner previously described, a further deposition occurred.

Manifestly the condensation is not induced by any special power on the part of the fabrics to absorb hydrocarbons of high boiling point, but is brought about by mere reduction in temperature. Apparently there is some disturbing influence at work which renders it unsafe to calculate the amount of vapour the gas can hold at any given temperature from the vapour tension in the manner that is usually adopted. Perhaps traces of high boiling hydrocarbons condense into minute drops on a very small reduction in temperature or rise in pressure, carrying down with them the benzol and other substances. Even the oils used to impregnate the material of the bellows may conceivably act in the same fashion as condensing agents. It should be noted also that any benzol which may condense is more easily volatilized again than a heavier hydrocarbon, and so is less likely to do damage. A deposit of such a liquid as xylol, however, may disappear when the temperature rises or when poorer gas is passed through the meter. The common absence of xylol and lighter bodies from the condensed matter in meters is often urged as a proof that they are not responsible for injury to the bellows; but this is erroneous—the absence being simply due to re-volatilization. A specimen of the liquid obtained from the meters in Bonn was distilled by Dr. Knublauch, and gave 0·67 per cent. at 140°, 15·33 per cent. at 200°, 13·37 per cent. at 260°, 4 per cent. above 260°, 56·67 per cent. of non-volatile matter, and 9·96 per cent. water and loss. Benzene, toluene, and the xylenes, were therefore essentially absent from the volatile portion; while the non-volatile part was composed of the fixed oils, &c., used in preparing the bellows. The amount of metallic matter found was so minute that, once again, the possibility of any real corrosive action upon the meters was disproved.

Further experiments were carried out with non-carburetted coal gas and with carburetted water gas. The former contained 5 per cent. of heavy hydrocarbons as a maximum; but if led through meters for a sufficient length of time, or at sufficiently low temperatures, produced the same results on the bellows made of vegetable fibre as carburetted coal gas. Carburetted water gas made by the hot process is not liable to condensation, for the carburetting agents have been converted into permanent gases; lightly carburetted water gas made by the cold process is not likely to injure the fabrics, because the vaporized hydrocarbons have been added to a gas which, unlike true coal gas, does not contain any heavy hydrocarbons to start with.

A sample of warm cannel gas was led through a dry meter fitted with chambers of vegetable fibre. After only 1200 cubic feet had passed, some of the graphite had been removed from the fabric, which had become yellowish and transparent, and was porous in places. Other experiments were tried, to compare the behaviour of a meter with unpainted metal surfaces, and meters which had been varnished and then given a coat of tar inside. The bare meter was placed in ice, and about 1500 cubic feet of cannel gas were passed through it. The condensed matter consisted of 760 c.c. of water and 120 c.c. of an oil having the odour characteristic of such condensations. After evaporation on a water-bath, the residue possessed the odour of the oil used to prepare the bellows. Two of the painted meters were tested "in series," the gas first passing through one, then through a long iron tube cooled in ice, and finally through the second. At the end of the test, the paint in the first was uninjured, but that in the second had become matt and dry. The first meter was then cooled, and showed identical effects after passage of more gas. The carbon separated from the tar was loose, and could be blown away; the oil was dark brown, and quite unlike the deposit in the unpainted meter.

The oily or dry deposits found in old meters were examined by washing them down with ether and alcohol. After evaporation, the extracts were yellow, possessing the odour of linseed oil. The solid matter consisted of graphite, tar carbon, and a little sulphide and carbonate of iron, together with zinc sulphide. In a few exceptional instances, traces of ammonia, thiocyanogen, and ferrocyanogen were met with. The metallic sulphides were presumably formed by the action of the sulphur compounds upon the metals of the meters, the traces of ammonia and cyanogen always in the gas perhaps assisting. The claim that air in the gas is injurious to the bellows of dry meters has already been mentioned. Albrecht has shown that a large excess of oxygen is harmful in wet meters filled with normal salt solutions; but if it, and the accompanying moisture, were to affect dry meters, most of the injury would be done to the metallic portions.

The makers of dry meters keep strictly secret the exact method by which their textile fabrics are prepared, and some of them purchase the fabrics ready for use from other firms. This renders it impossible to say precisely why the bellows fail, and why the failure seems to be more common with comparatively modern bellows. It also prevents any experiments performed with such bellows from being generally instructive. Leather bellows are not perfect, but they are better and more lasting than the others; and they are not injured by a properly carburetted gas.

In conclusion, the author recommends all gas-works which have many dry meters in use fitted with fabric bellows to watch them carefully, or they will lose gas by penetration through the chamber walls before the meters cease to register. Where many such meters are employed, the employment of carburetting agents like benzol and xylol should be avoided or restricted as much as possible. However, now that high illuminating power in a gas is less required, and naphthalene stoppages can be prevented by washing the gas in anthracene oil instead of by loading it with liquid hydrocarbons, now that the high temperature of carbonization reduces the amount of heavy hydrocarbons naturally present, dry meters with vegetable bellows seem likely to show a longer average lifetime than they have hitherto.

* A mixed hydrocarbon resembling, but somewhat lighter than, partially rectified xylol.

American Gas and Coke Making Processes.—Mr. J. C. H. Stut, of Oakland (Cal.), has patented a process for the manufacture of gas and coke. A body of coal, contained in one of a series of parallel contiguous ovens, is heated to incandescence by passing air over and up through the burning fuel. The air supply is shut off and crude oil is fed upon the surface of the fuel, whereby oil gas is generated and oil residue deposited. Then steam is introduced from below; the water gas produced mingling with the oil gas at the surface of the fuel. Simultaneously, a body of coking coal, contained in a contiguous oven, is carbonized by the heat transmitted through the dividing wall, and the coal gas produced is led along with the water gas and oil gas through a fixing chamber. The operation is then reversed by filling the second oven with fresh coal and introducing steam below and oil above the fuel as already stated, while the heat transmitted through the dividing wall produces coke and coal gas from the coal and oil residue in the first oven—the various gases being mingled and fixed as before. Mr. Stut has also patented the following process for manufacturing gas: An oven, having a layer of incombustible porous material at the bottom, is heated to redness. Crude oil is injected on to the incandescent material, forming oil gas and a carbonaceous deposit. After the latter has become coked, it is consumed in the production of water gas by passing steam up through it. The oil gas and water gas are mixed. The heat transmitted through the walls of the oven may be employed in producing coal gas from a body of coking coal in a contiguous connected oven, the several gases being mixed together.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Preston Gas-Works.

Last Saturday, a visit was paid to the Moor Lane works of the Preston Gas Company by a party of about twenty members of the above-named Association. They were received at the works by the Engineer and Secretary, Mr. Henry Green, Assoc.M.Inst. C.E. In addressing the visitors, he said he had been with the Company for 43 years—coming to Preston from Bolton. He thought Preston had the honour of possessing the first provincial gas-works in the kingdom; these being erected in Glover Street in 1815. The works they were about to go through did not contain any machinery for stoking or handling coal and coke, but were constructed on the principle of three levels. This represented, for all practical purposes, an extension of the area, and provided, in the absence of railway accommodation, the most economical mode of handling the coal and coke. The main or intermediate level included the working floor of the retort-house. All the coal was brought to the works by cart or motor lorry, and taken to the higher level, where it was discharged on to the retort-house level 14 feet below. From 5000 to 6000 tons of coal could be stored in this way, with the assistance of one man only.

Entering the retort-house, Mr. Green told the visitors that it had been erected on the old site of three gasholder tanks. This was the reason for its being so well cellared. The house contains 252 mouthpieces, one generator furnace serving 28 retorts. Mr. Green pointed out that he dispensed with the hydraulic main in favour of an invention of his own, which takes the form of a small valve that is closed whenever the retort-lid is to be opened. In the retort-house there is also a carburetted water-gas plant capable of producing 1½ million cubic feet per diem.

From the retort-house the visitors were taken to the sulphate-house. This proved so interesting that the greatest portion of the time was spent there. The whole apparatus differed so much from the usual style of plant, and contained so many novelties, that the members were loth to leave this department. Mr. Green remarked that he was proud of his sulphate plant, which he had started the previous day for the express purpose of letting the members see it at work. He said it was rather different from most plants. The liquor, lime, and acid all ran in by gravitation; and he had a copper saturator which discharged at the bottom, thus doing away with "fishing." He ran on for 24 hours, and then discharged the whole of the salt—about 2½ tons—at once. The visitors had an opportunity of seeing this done; and when they passed about half-an-hour later, they found the recently discharged salt quite dry.

The purifying-house was of exceptional interest. It is 166 feet long by 80 feet wide, and contains six purifiers—two 90 feet by 35 feet, and four 30 feet by 35 feet—all 5 ft. 6 in. deep. They are of the dry-sealed type—Mr. Green's invention. Mr. Green explained the reason he devised dry-seal purifiers, and said he had them working a number of years unknown to anyone else. The present purifiers occupy 12,000 square feet; whereas in the other system upwards of 16,000 square feet would be required to secure an equal purifying area. On passing the scrubbers, the visitors learnt that they were fitted with canvas screens—another of Mr. Green's ideas. He explained that by their use the scrubbing area was double that obtained by means of the thin boards usually employed in scrubbers.

At the close of the inspection, Mr. Green invited the members to tea. After the repast, the President (Mr. W. Hill, of Stalybridge) said that on arriving at the works that afternoon Mr. Green had given the members the impression that they would not find anything there of interest, as he had no coal or coke handling machines or other novelties. He (Mr. Hill) thought their visit had proved that the Preston Gas-Works were of special interest. Mr. R. T. Stoddard (Halifax) moved a hearty vote of thanks to Mr. Green for permitting the members to visit the works, and for his kindness to them that afternoon. Mr. R. H. Ginman (Tyldesley) seconded the motion. Mr. Green, in responding, gave his guests some good advice; particularly pointing out the danger of sacrificing the practical for the chemical and scientific side.

The party subsequently visited the Harris Museum and other places of interest in Preston before returning to Manchester.

USE OF TAR ON MACADAMIZED ROADS.

In the current number of "Le Gaz," M. Jouanne, the Technical Editor, gives a few particulars relative to some experiments that were carried out at the beginning of last July in the Avenue de la Grande Armée and the Boulevard Maillot, in Paris, in the use of tar upon their surface. The roads named are macadamized; and the results obtained seem likely to lead to a final satisfactory solution of this question. In the Boulevard Maillot, the tar was applied by means of a watering-cart, similar to that devised by MM. Lassailly and Bichebois, a firm of tar distillers, at Issy-les-Moulineaux; but it was specially prepared for the purpose. The process consists in heating the tar to a temperature of about 200° C. (400° Fahr.), so that during its transit from the works, which may occupy three or four hours, it may not cool to less than 150° C. (300° Fahr.) before reaching the place where it is to be applied. In order to attain this result, the tar has to be completely freed from water before being heated, because, as is well known, when it contains a certain percentage of water, it will boil and begin to foam as soon as the temperature reaches about 70° C. (160° Fahr.). This explains the difficulty, and even danger, encountered in heating tar, as soon as it begins to boil and flow over the vessel in which it is heated. Complete elimination of water from the material averts this inconvenience, and therefore MM. Lassailly and Bichebois were able to heat the tar to 200° C. before filling the special cart with which the road is tarred. As soon as the cart reaches the road, the tar is tapped by means of a cock at the back of the vehicle. It is caught in a kind of pail, at the bottom of which there is a horizontal pipe, about 6 ft. 6 in. in length, perforated with numerous holes through which the liquid is projected in jets on to the road. Sweepers, armed with brushes, follow the cart, in order to spread the coating of tar evenly over the surface of the ground. In the experiments made in the Boulevard Maillot, it only required an hour-and-a-half to tar a section of the road measuring 2760 square yards with 39 sweepers following the cart.

CALORIFIC VALUE OF DIFFERENT FUELS.

The "Proceedings" of the Institution of Civil Engineers for the present year contain the results of some investigations into the above subject carried out by M. Mahler, and published in the "Revue Universelle des Mines." The following table gives the flame temperature obtainable when the fuel named is burned with air at 32° Fahr. and at an atmospheric pressure of 30 inches.

—	Calorific Power.		Flame Temperature.
	Water Condensed.	Water as Vapour.	
	Calories.	Calories.	Deg. C.
Peat, Bohemia	5900	5,590	2020
Lignite, Trifail, Styria	6650	6,370	1960
Flaming coal, Blanzy	8350	8,060	1990
,, Decazeville	7840	7,530	1960
Weathered coal, Commentry	6380	6,200	1960
Gas coal, Commentry	8410	8,110	1950
,, Bethune	8670	8,380	1990
,, Lens	8740	8,450	2010
Coking coal, St. Etienne	8860	8,580	2010
Smithy coal, Roche la Molière	8860	8,600	2030
Semi-bituminous coal, Auzin	8660	8,430	1980
Anthracitic coal, Commentry	8460	8,290	2030
,, Kebao (Tonkin)	8530	8,370	2020
,, Creusot	8690	8,480	2010
Pennsylvanian anthracite	8266	8,140	2000
Ethyl and methyl alcohol	..	..	1700
Amyl alcohol	..	..	1850
Crude American petroleum	..	10,400	2000
American petroleum spirit	..	10,270	1920
,, refined petroleum	..	10,280	1660
Hydrogen	..	..	1960
Carbon monoxide	..	..	2100
Methane	..	..	1850
Acetylene	..	..	2350
Illuminating gas (average)	..	..	1950
Water gas in industrial use	..	..	2000

In giving the foregoing figures, it is pointed out that the true measure of value of a fuel is not the flame temperature, but the calorific power. For example, the flame of peat is hotter than that of St. Etienne coal; but the body of flame is much larger in the case of the coal than in that of the peat. A piece of peat weighing 100 grammes yields 28 volumes of gas at 2000° C.; while the same weight of coal yields 44 volumes of gas at a like temperature.

Benzol as a Motor Fuel.—A well-known motor manufacturing firm have been supplied (says the "Pall Mall Gazette"), by a corporation owning gas-works, with benzol having a density of ·86, and have used it for driving motor-cars with most interesting results. Although no road data are at present available, the "Autocar" understands the benzol not only works perfectly in the carburettor without any adjustment other than that required to run on ordinary spirit, but also that invariably the motor starts on the first pull round of the starting-handle, and, in fact, starts and continues to run much more uniformly than is the case with petrol. Further, benzol of ·86 density can be bought for 6d. per gallon, and yet give a good margin of profit to manufacturer and agent. It is found, as a result of careful trials that, on an engine which under normal running consumed a gallon of petrol for an equivalent of twenty miles running on the road, only one gallon of benzol was consumed for an equivalent of thirty miles running, or in other words, the cost of running the car on petrol would be at the rate of one-and-two-third miles for a penny, while on benzol five miles would be obtained for the same amount, reckoning petrol at a shilling a gallon, and benzol at sixpence. Thus the running cost would be just one-third when benzol is used.

HIGH-PRESSURE DISTRIBUTION IN CALIFORNIA.

At the Annual Meeting of the Pacific Coast Gas Association, a paper on this subject was read by Mr. E. C. JONES, the Chief Engineer of the Gas Department of the Californian Gas and Electric Corporation. The following is the text of the paper, with some extracts from the remarks to which it gave rise.

The best system of what is known as low-pressure distribution, with cast-iron mains and large feeding-mains reaching out from the storage holders, does not and cannot meet the requirements of the ordinary gas consumer for satisfactory service. The initial pressure is constantly changing as the holders are raised or lowered, and the "peaks" of demand for gas are supplied by "valleys" of pressure. No matter how well arranged the system of piping may be, there is always a difference between the initial and terminal pressures in the district; and as the demand for gas increases, this difference becomes more pronounced.

Owing in a large measure to the successful introduction of incandescent electric lighting, gas has been forced to find a new field in order to keep up the proverbial increase of doubling the output every ten years. This new field has been in the line of cooking and heating; and the business of cooking and water heating has brought about three new "peaks" in the delivery of gas, during the preparation of breakfast, luncheon, and dinner, and at the same time the burner units for using gas have increased in size many times. These "peaks" require special handling in order to give satisfactory service, because the bunsen burner used for cooking and heating must be so arranged for economy and efficiency that the gas and air are rightly proportioned; and it is evident that, in order to accomplish this, the pressure of the gas must be exactly uniform. This can only be done by an individual pressure regulator at each consumer's meter, and by the maintenance of pressure at the inlet of the regulator at all times greater than the outlet pressure for which the regulator is set. For instance, 4 inches of pressure (water column) seems to be satisfactory for the operation of any gas appliance having bunsen burners; so that all house regulators would be set to deliver the gas at the outlet at this pressure.

In order to be assured that this necessary pressure will be constantly maintained, it is essential that the street-main pressure shall be kept at a point high enough to ensure sufficient "storage" of pressure against sudden demands for gas. This cannot be done by ordinary distributing systems served by gasholders which are diminishing in pressure as the demand increases, or on long stretches of small pipe where the consumers are severely trying the capacity of delivery of gas at any pressure at the farthest end. High-pressure distribution has come to our relief; but it came into the field like a whirlwind, and the gas men of the country began to consider the distribution of gas at pressures of from 25 to 300 lbs. to the square inch. After much experience, that whirlwind of ideas has been harnessed and refined, so that now its application is adapted to the existing needs.

Supposing it is desired to supply a town or a chain of towns at a distance from a central gas-making point, it is first necessary to make a careful estimate of relative initial cost and operating expenses between various sizes of pipe and the initial pressure necessary to deliver the required quantity of gas with ample margin for growth. This leads the engineer into a mass of calculations, with the result that he is astonished at the large quantities of gas which can be forced through long lengths of 2-inch pipe at moderate pressures; and the increase of business is provided for by the ability to increase the initial pressure up to the economical limit of single stage compression—say, 80 lbs. per square inch. An installation of this character requires good workmanship and material. The pipe should be carefully tested, thoroughly protected against corrosion, and should be what is known as "plain end," with no screw joints. Each joint should be made with some approved form of coupler, using rubber gaskets, which are jammed down so that only a feather edge of rubber is exposed to the action of the gas. The use of a joint of this character, besides ensuring tightness, obviates the necessity of touching the pipe with tongs or other tools, so that the protective coating is not in any way injured, for it is almost as harmful to lay a pipe uncoated as it is to have bare spots on each length of pipe.

In laying out a high-pressure system of this kind, it is best to first instal the compressor complete, and to run the pipe from it; testing each day's work by compressed air. This will be found much more convenient than testing the pipe in small sections by means of a hand pump, and it is sometimes helpful to use a small amount of ether at the compressor, so that the compressed air will have a noticeable odour. This facilitates the finding of small leaks. After the installation of the pipe-line and compressors is completed, it should be the duty of the gas engineer to determine how low rather than how high a pressure can be carried; and this study will lead to the installation of compression tanks for storage along the line of the pipe, and a gradation of pressures regulated by governors to meet the requirements of each separate portion of the district to be supplied. This is for economy, safety, and the assurance of a constant supply of gas.

In California, Grass Valley and Nevada City are supplied with gas under high pressure. These towns are situated 4½ miles apart, and the high-pressure pipe-line connecting them is of 2-inch wrought iron, with screw joints. The pipe is well protected, and does not show any sign of leakage. The gas is made at Grass Valley, and is stored in compression-tanks at a pressure of 80 lbs. per square inch; while the compressor is operated by a gas-engine, so that the cost of compression may be easily determined. The pressure is reduced to 20 lbs. by means of a district governor; and it is maintained throughout the transmission line to a point where the line joins with the distributing system of each town, where it is reduced to 15 lbs. Every meter is provided with a separate pressure regulator.

Another instance of high-pressure distribution is in the town of Petaluma, which is connected with Santa Rosa by a 2-inch pipe-line 16·8 miles long. The gas is made at Santa Rosa, and is compressed and forced to Petaluma at pressures to meet the demands of the consumers, which at present are as follows: 6.30 a.m. to 8 a.m., 25 lbs.; 8 a.m. to 10 a.m., 15 lbs.; 10 a.m. to 11.30 a.m., 40 lbs.; 11.30 a.m. to 4 p.m., 15 lbs.; 4 p.m. to 6 p.m., 30 lbs.; 6 p.m. to 6 a.m., 10 lbs. The distributing system is of small-sized steel pipe, and the gas is distributed under high pressure in a manner similar to that employed at Grass Valley and Nevada City. The town of San Mateo is also supplied under high pressure through a 2½-inch pipe-line, rather more than 8 miles long, from Redwood City.

Apart from the advantages of high-pressure gas distribution in small cities and between cities, high pressure supplies the needs of a larger field, and one of growing importance, in "boosting" the pressure in cities where the low-pressure system consists of small mains with numerous dead-ends; whereas, without the help of high pressure, these systems would have to be condemned and replaced by others more modern. One of the best examples of this may be found in the city of Fresno, which is piped with small mains; and as the city has rapidly grown, these mains have been extended in all directions until it became a problem to maintain any pressure and supply of gas at extreme points. At the same time the city was rapidly growing in two directions in what is known as "additions," which were built up with a good class of houses, requiring gas for cooking and heating. To save the old distributing system, and supply gas to these additions, a 2-inch loop was laid completely round the city, from the gas-works back to the gas-works again, and at the principal dead-ends of the old low-pressure system connections were made with the high-pressure loop, using a district governor to reduce the pressure to 4 inches of water.

This arrangement equalizes the pressure at every point in the city; and should an accident happen to any of the governors, by the breaking of a diaphragm or otherwise throwing the high-pressure gas directly into the low-pressure mains, the gasholders at the works act as safety-valves to keep the pressure down to a point where no damage can be done to ordinary gas meters or fittings designed for low pressure. This emergency has never arisen; but the safeguard stands ready at all times. From the 2-inch loop, high-pressure wrought-iron mains lead out into the additions, and the houses are connected by ½-inch services and governors at the meter; so that the city is supplied by a combination system—the same loop reinforcing the low-pressure district and supplying a high-pressure one. The initial pressure on the loop at the gas-works is 15 lbs. per square inch.

A *résumé* of personal experience with a high-pressure installation has demonstrated the importance of the following points: Always provide duplicate compressors. Never depend upon a source of power which will fail, unless another means is at hand. This is particularly important where a compressor is operated by an electric motor, for should the current fail, the gas consumption immediately increases—usually twofold—for the reason that gas is then used for lighting to take the place of electricity. Unless there is a residual which supplies cheap boiler fuel, gas-engine power is the most reliable and satisfactory for running compressors. If the capacity of the transmission line will not store gas enough under pressure to supply the consumption for 30 minutes, use compression tanks. In any event, the use of these tanks tends to economy, because they may be located above ground, are easily accessible, and are perfectly gas-tight; and as the compressor works at a constant speed and pressure into the tank or tanks, the pressure at the outlet may be governed to any desired point. A check-valve should be placed in the line of pipe between the compressor and the tanks, to prevent the gas from blowing back in the event of an accident to the compressor.

In laying pipe, each length should be stood on end, and all scale and dirt hammered out. All pipes should be carefully examined for splits before being painted with two coats of red lead mixed with the best boiled linseed oil. Should it be thought desirable to make use of screw joints, every joint should be made with sockets or other fittings having taper threads to correspond with the taper of the ordinary threads on the end of the pipe. Pipe should be made up one length at a time, and should be graded to take care of drippings, just as with low-pressure piping; but in the place of drips, outlets with lock stopcocks are substituted. This is important, because the whole or portions of the system may be without pressure in cases of emergency, when water may leak into the pipe from the outside, or the pipe-line may become flooded with water during the process of construction. There are many other reasons why it is desirable to give some thought to the proper grading of the pipe, although it is not nearly so vital as in the low-pressure gas distribution, because any accumulation of liquid may be easily blown out of the pipe

line, and it is never necessary to use a pump. In calculating the size of pipe necessary, always err on the right side by making the pipes amply large. For instance, a 1½-inch pipe is really more than twice as large as a 1-inch pipe, while the price is not twice as great; and the 1½-inch pipe is much stronger, and more capable of resisting strains from outside.

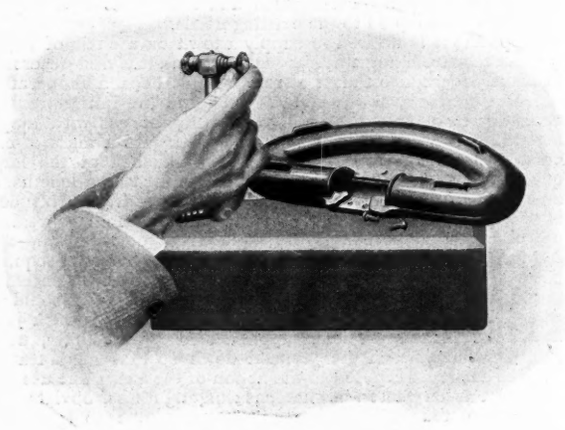
Finally, the advantages to be derived from compressing gas must not be overlooked; and it is a question worthy of discussion whether it is not advisable and economical to subject all illuminating gas to the physical change which takes place during compression, on account of the condensing and cleansing effect on the gas. It is well known that the candle power of gas is not affected by raising the pressure to about 20 lbs., on account of the taking out of water up to that point which would otherwise reduce the heating value of the gas; and at pressures above 20 lbs., any loss in candle power, which, at the most, is almost negligible, is due to the removal of unstable hydrocarbons which would be better taken out at the works. The effects produced in compressing gas by de-hydrating it and condensing out particles of dust, lampblack, or unstable hydrocarbon vapours, greatly improve the service on high-pressure distributing systems, where stoppages by water, naphthalene, or dust are unknown. In fact, the advantages of compressed gas are so apparent that all consumers appreciate them and draw comparisons between old and new methods; and it has been the experience at Fresno that consumers on the low-pressure system have asked to be placed on high-pressure mains.

In the course of the discussion upon the paper, Mr. Colquhoun remarked that he was supplying about 300 consumers from high-pressure mains, and was also "boosting" up the low-pressure ones. His experience was that the consumers were much better served, and were consequently better pleased, than they were under the old system. The principal trouble was that they had had too much gas. The proper grading of the pipes was an important matter. He put in drips about 1000 feet from the compressor, in order to catch any condensation. If the water was taken out there, no trouble arose beyond. A safety-pipe should be put upon each governor, so as not to extend the pressure beyond the meter in case of a break. Mr. Britton said one factor in connection with the distribution of gas at high pressure was the absolute necessity of providing, at the inlet and outlet of the compressor, pipes large enough to deal with the "surge" that would sometimes occur. Mr. Colquhoun remarked that when he first connected he had a 4-inch inlet, and it was unsatisfactory. He then put in a steel cylinder 42 inches in diameter and 22 feet long, and connected directly from the outlet of the holder to the cylinder. A small pipe was not good. Mr. Grover thought an interesting point in the paper was the practicability of running a compressor with a gas-engine. He made some observations as to the quantity of gas necessary to compress a given bulk, and found that about 10 per cent. of the gas compressed was required for the engine. The observations were made on the gas-engine at Grass Valley, at an elevation of 2000 feet; and no difficulty was experienced in running the pressure up to 100 lbs.—the rating of the engine being very close to the factor of safety for the compressor. Mr. Miller said that at Los Angeles they had driven compressors with a loss of only about 3 per cent. He should consider 10 per cent. excessive. Mr. Lowe also looked upon the latter as a rather high figure. Mr. Stirling thought electric power would be cheaper than using 10 per cent. of the gas for compression purposes. Mr. Miller, referring to the amount of pressure, said he considered 100 lbs. too high; and he reminded the meeting that Mr. F. H. Shelton was of opinion that from 20 lbs. to 25 lbs. was the highest economical working pressure. In the case of works sending out from 300,000 to 400,000 cubic feet of gas per hour, high pressure would not pay. Mr. Gutsch remarked that most of the governors which had been designed did not close automatically in case of accident, nor were they adaptable where the pressure changed, particularly where the compressor worked only part of the time, and where the compression was the thing which had to be regulated. Mr. Weber said he had had some experience with high-pressure gas; having individual governors, as described in the paper. Though they had about 500 installed, not a single diaphragm had given out. They were set to give 4 inches water pressure at each outlet. The pipe-laying should be first-class workmanship. If the mains had been under a pressure of 3 or 4 inches, and they then applied one of 25 lbs., the leakage would be many times what it was with low pressure. He thought high-pressure supply should not very much exceed 25 lbs.

Replying to the discussion, Mr. Jones pointed out that Mr. Grover's statement about using 10 per cent. of the gas compressed for driving the engine, had reference to a small motor, where the efficiency was probably 2½ times less than it would be in modern gas-engines. Moreover, he was not quite sure that the altitude at which the engine was located did not affect its operation. Personally, he believed that there was no more economical source of power than the gas-engine. Mr. Miller's remark as to Mr. Shelton's opinion being that the pressure on the mains should not exceed 25 lbs. per square inch was corroborative of the statements in the paper. He thought they ought to study how low rather than how high a pressure they could carry. They must remember that when they mentioned ¼ lb. pressure, they were talking about twice as high a pressure as that usually put upon the mains under the ordinary system. Mr. Weber's statement meant that he had 100 per cent. overload on his mains to overcome, and provide 4 inches pressure on the house service-pipes. It must be borne in mind that compression tanks acted as storage holders; and he firmly believed that working the compressors up to the economical limit of 80 lbs. per square inch into the tanks, was the best practice. They could then cut down their street-main pressure to any point desired. With regard to the handling of the governors—the point brought out by Mr. Gutsch—every high-pressure governor should have a sufficient valve opening, so that, in the event of the pressure going off entirely, there would still be a supply of gas. The governors now in use had ample valve openings, and the valve itself was fastened by a joint to the lever connected with the diaphragm operating the valve; so that if the pressure went off the line, the diaphragm dropped and the valve was lifted—thus permitting enough gas to go through to keep the light burning. Mr. Jones added, in answer to a specific question as to the smallest-sized pipe he would advise to be used in a high-pressure gas-distributing system, that within the past two years he had changed his mind on this matter. When the high-pressure system was laid out in Fresno, he used 1, 1¼, and 1½ inch pipes—nothing larger than 2 inch. If, however, he had now to lay out an ideal system, he would use nothing less than 2-inch pipes for mains and couplers, and ½-inch pipes for services. The service-pipes could be safely connected by using any of the heavy saddles made for the purpose; lead gasket being put between the pipe and the saddle.

THE GAS-FIRE SEASON.

Two things remind us forcibly of the gas-fire season—first, the low temperatures that have persistently prevailed during the past few days, and, secondly, the arrival of communications from the makers of gas-fires respecting their specialities for the coming winter. The Richmond Gas Stove and Meter Company, Limited, are again recognizing the importance of paying special attention to facilitating the work of maintenance, as one way of giving encouragement to the cultivation on the part of gas undertakings of a hiring-out business in gas-fires. Now that the principal parts of gas-fires can be made as easily renewable, and as readily cleaned, as the portions of cookers that must deteriorate after long use, there seems to be little or no reason why the hiring out of gas-fires should not be developed with less reluctance than has hitherto been exhibited. Where there is hiring out of gas-fires, it is certain there must also be maintenance. Herein is found one of the features of the stoves which the Richmond Gas Stove Company have on view at their show-rooms. All parts which are likely to become affected in use are made removable, and capable of being replaced without disconnection of the fire. Another



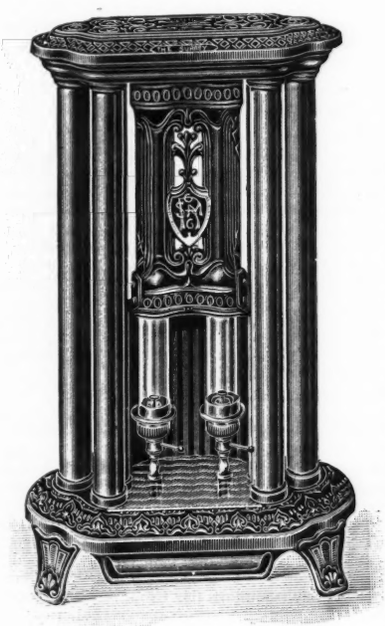
The Small Air-Regulating Fitting.

point worth being brought to notice is that, in conjunction with the removable burner, there is now supplied with all types of stoves an adjustable nipple-piece, by which the air-supply to the burner can be accurately regulated to suit the character of the gas distributed in any particular locality. Where this arrangement has been adopted, it has met with much favour. It is merely a small brass fitting which screws on to the gas-supply pipe, the two projecting arms of which fitting carry the nipples through which the gas is fed into the burner on either side. Surrounding each nipple is a slotted collar, which, by being screwed outwards towards the inlet of the burner, decreases the air-admission apertures, or by the reverse operation increases them. The effect this regulation has upon both the efficiency of, and the diminution of the noise occasioned by, the gas-fires is very noticeable.

To keep together the points bearing upon the question of maintenance, it is a little surprising that the value of the various new coloured coatings for stoves—such as the "Porcellanite" of this

firm—has not received greater recognition. The two paramount points about it are, that it can be cleaned by simply washing, and that considerable experience proves its permanence, added to which virtues is the fact that it can be obtained in a variety of colours, which enables the fires to be made to harmonize with the appointments of any room. Where, too, a black casing to a fire becomes duller and heavier in appearance or bronzed decorations tarnish as time passes, the casings coated by this means always retain a fresh appearance. In hiring out fires among the better-class houses, these are matters for consideration; besides which backgrounds can be obtained of any colour for filling in the old grate openings—the combination being excellent.

Passing from the general to the particular, two or three improvements in the firm's radiators and fires may be mentioned as examples. The "Guildhall" radiator first claims attention; its appearance alone attracting the eye. Inquiry and experiment soon disclose where the improvements are to be found in this radiator. In the predecessor of this new form, the heat passed from the bottom burner direct up the central tubes, and the condensation took place in the outer ones. The effect of this was that the greatest heat was concentrated in the central tubes. In the new type, the heat from the bunsen flames of the burner (which is a hinged one, and so can be pulled out for lighting) is deflected horizontally to the right and left, and then passes up the outer tubes on either side, and into the top chamber connecting all the tubes together. Then, contrary to the old form, condensation takes place in the shorter central tubes; resulting liquid being collected in a pan carried on a slide immediately below the latter. There is no doubt that, by this type of radiator, the heat is better distributed through its decentralization than by the old type. The radiator is fitted with the patent adjustable attachment for regulation purposes; and the burner (which is the only part that is likely to require renewal) is removable. The radiator should be very useful for hiring out, particularly for the heating of school rooms, halls, &c. The consumption of gas is about 10 cubic feet per hour; and it is made with seven, nine, or eleven tubes.



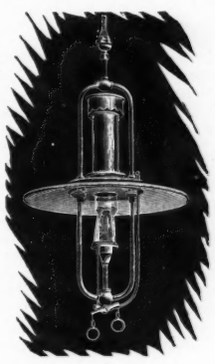
THE "SURREY" DOUBLE-BURNER CONDENSING-STOVE.

The "Triumph" gas-fire has also undergone certain further improvements—both decorative and useful. To enhance the appearance of the casing, new and pretty designs in *repoussé* work have been introduced into the panels, as well as a new type of canopy, which has quite changed the general style of the fire. The top panel in the hood of this fire lifts out, and below is a pan for water for evaporative purposes. Under the fire, the fender is hinged, and can be opened for the removal of the burner for cleaning, adjustment, or replacement. The efficiency that can be obtained through the aid of the regulating attachment is well demonstrated by this fire. The consumption of gas is from 30 to 35 cubic feet per hour. By the addition of another tube on either side, the "Surrey" condensing-stove has been converted from a single to a double-burner one, with two results that the heating power is, of course, greater, and that it is now far more handsome than formerly. Of course, the manufacture of the single-burner form has not been discontinued. The Cambridge condensing-stove has likewise been re-arranged so as to take a double burner; and in this case it has been accomplished without altering the dimensions. Coated with "Porcellanite" enamel, these condensing-stoves are very attractive. Several of the other fires of the firm have been transformed by changes in shape.

Members of the North of England Institute of Mining and Mechanical Engineers last Thursday visited the Redheugh Gas-Works, Newcastle. They were taken round by Mr. W. Doig Gibb, the Chief Engineer, Mr. T. Hardie, the Manager, and Mr. G. Henderson, the Assistant-Manager. The visitors first went through the retort-houses, of which there are four. Then they saw the coal and coke conveying machinery, the process of purification, and the manufacture of sulphate of ammonia.

THE PODMORE AND THOMAS PATENT LAMPS.

In some correspondence not long since published in the "Ilford Guardian," Mr. A. A. Johnston, the Engineer of the Ilford Gas Company's works, put the electricians to rout over their claims respecting the electric light. He was able to do this by references to actual installations of high-power incandescent lamps in the town which were open to all to investigate for themselves. There was one of them, a large drapery and furniture emporium from which the electric light had been banished. In this instance, 63 incandescent electric lamps were displaced from one part of the show-room, which lamps had a total lighting value of 1008 candles, and consumed four units of electricity costing, at 5d. per unit, 1s. 8d. per hour. In their place, 34 gas-burners were fitted, each giving a light of 150 candles, and consuming 8 cubic feet of gas per hour. This meant in the aggregate a light of 5100 candles, for an expenditure of 272 cubic feet of gas costing 11d. These claims are designedly put at a low rate, so that there should be no difficulty at any time in substantiating them. Photographs have been taken of these gas-lighted premises, during the hours of lighting; and in these photographs the sharpness and clearly defined patterns on the goods exposed in the show-room are magnificent testimony to the brilliancy of the lighting. Inquiry showed that the lamps used were on the Podmore and Thomas recuperative system; and the manufacturers are naturally highly delighted with the success their lamps have scored for gas at Ilford. From their original form of street-lamp, Messrs. Podmore and Co. have made many developments, so that the acknowledged benefits of their system may be obtained in any situation—both indoors and outdoors. There is one form which is now being made in several styles—suitable for dining-rooms, libraries, halls, shops, and, in fact, almost any inside place where a good light is required; and with opal crimped rose-flashed shade, and with the metal parts of the lamp nickel-plated or coloured (say) in Indian brown, these lamps look very handsome. Of course, they are made in plain styles for positions in which an ornamental lamp would look out of place.



In these new lamps for indoor lighting, the now well-known recuperative principle of the firm's speciality in lamps is maintained, as well as the high duty per cubic foot, although it is (as Mr. Johnston has done in the figures quoted above) wise to claim something that under any adverse circumstance can be sustained as true. In these inside forms of lamp, the frame is made to convey to the burner the heated air from the upper part of the lamp. The metal chimney above is a double one, so that the products of combustion pass up the central tube, and the annular space between the two supplies the source of heated air. The chimney is enlarged just above the reflector; and this forms a chamber, into which the air is admitted for heating, and from which the hot air is drawn for feeding the burner. No air reaches the latter but that which first travels through this chamber. As mentioned, it is carried down the frame of the lamp to the foot of the burner, and is there discharged into the small chamber containing the gas-nipple. Into this chamber, the burner simply slides, and so can be withdrawn quickly for cleaning purposes. There is no doubt that one of the developments made by the firm is in the direction of simplicity; and this is seen particularly in the substantial and clear character of the burner. Beyond these points, the form of mantle-protector which has been devised, as well as the freedom with which the burner is kept from dust through the system of admitting the heated air supply, have all, users assert, a marked effect on the preservation of the mantles, and on the maintenance, with very little care, of the illuminating power. These points suggest, too, that in business places where dust and other particles are floating about in the air, the protection afforded to the burners by these means must have a good effect in giving relief from constant attention. Some of the lamps are specially made for particularly troublesome situations, so as to afford as much defence as possible to the burners. All the lamps are fitted with an adjustable screw, in order to regulate the supply to the burner according to local requirements.

In addition to the single-burner lamps, Messrs. Podmore and Co. make them in cluster form. They prefer, for several reasons, to increase the source of illumination by additional burners rather than by augmenting abnormally the size of a single burner. It is altogether more convenient in the matter of mantles for the user to have small-sized burners, as, if anything goes wrong with one burner or mantle during the hours of lighting, it does not put the whole lamp *hors de combat*. These cluster lamps can be made of large size, and with an aggregated illuminating power to any extent within reason. There is nothing flimsy about the work put into the lamps. All parts are solid, and, being solid, are strong; and their finish will meet the views of the most fastidious for good workmanship. This applies not only to the new cluster lamps, but to all types of the single ones as well.

LEGAL INTELLIGENCE.

The Failure of the Scott-Snell Self-Intensifying Gas-Lamp Company, Limited.

In connection with the failure of the above-named Company, which occurred during August, the statutory meetings of creditors and shareholders were held at the Board of Trade Offices, Lincoln's Inn, before Mr. H. M. Winearls, the Assistant Official Receiver, last Tuesday. The Chairman reported that the Company, which was registered in December, 1900, with a nominal capital of £1,000,000, divided into shares of £1 each, was formed to enter into an agreement with the Perfect Light Company, Limited. Under this agreement, dated Dec. 24, 1900, the Company acquired all the patents of the Perfect Light Company in connection with the Scott-Snell lamp, together with the benefits of pending applications for patents for foreign countries, and all subsequent improvements. The purchase consideration was £950,000, of which £900,000 was to be satisfied by the allotment of the ordinary capital of the Company, and the balance in cash or shares. A prospectus which was issued disclosed the fact that the patent rights were purchased by the Perfect Light Company for £20,000, and that the price to be paid for them by the present Company was £950,000. The Official Receiver was informed that this figure and the amount of the capital was fixed by Mr. H. C. Bucknall, who was a Director, and would only interest himself in large concerns. It was also considered that the amounts were calculated to impress foreign countries with the great importance of the invention. With the object of disposing of some of the foreign patents, two of the Directors went to America in February, 1902; their visit to that country involving the Company in expenses to the extent of £7748. No sale of the patents, however, was effected. In September last year, debentures for £13,931 were issued; and the following July, a debenture action was begun by some of the holders. As a result of this action, Mr. A. W. Tait, one of the Directors, was appointed Receiver and Manager of the Company's business. The failure of the Company was attributed to the cost of the manufacture of the lamps being more than was anticipated. The Directors were firmly of opinion that they would effect a complete revolution in gas lighting; and it was claimed that the illuminating power would be increased from 60 to 300 candles by their lamps with gas at normal pressure. A statement of affairs had been filed showing liabilities £17,717, of which £13,439 was expected to rank; and the assets, apart from the patents, were valued at £4271. These assets were, however, required to meet loans raised on debenture bonds. It appeared that the patents were of considerable value; but, for all that, unless they were worked there was very little prospect of the creditors receiving anything. A total deficiency of £1,003,439 was disclosed with regard to the shareholders. At both meetings, it was decided to leave the liquidation in the hands of the Official Receiver; and a Committee of Inspection was appointed to assist him.

Gas Company's Unsuccessful Claim at Chertsey.

At the Chertsey Petty Sessions, last Wednesday, Messrs. Dewar and Co., the whisky distillers, were summoned by the Chertsey Gas Company for £22 16s. 10d., for gas supplied to the Bridge Hotel. Mr. Chaldecott, who defended, at the outset contended that the action was out of date at the Court. He said that the Summary Jurisdiction Act laid it down that the claim should be made within six months of the latest part of the claim, which was January, 1903. Therefore, as the claim had only just been made, his contention was correct. Mr. Brett (for the Gas Company) argued that the opinion stated by Mr. Chaldecott was not binding, and that the Bench had to form their own idea as to what was the intention of the Act. They were still supplying Messrs. Dewar at the Bridge Hotel; and he contended that the limitation period ran from the date of the last supply or demand. This demand was sent in only a month ago; and it would be most unreasonable to suggest—when there was continuous supply and a series of demands and payments on account—that the Act could prevent the recovery of arrears in the form suggested by the other side. Mr. Chaldecott said that a Mr. Fownes occupied the house during the time the amount claimed was incurred. All bills were sent to him, and he paid them with his own cheques as tenant. He contended that Fownes (who had gone away) was liable. Mr. Brett, in stating his case, remarked that the summons was for gas supplied between Aug. 18, 1901, and September, 1902. After Jan. 7, 1903, Messrs. Dewar admitted liability, but not during the time that Mr. Fownes was in occupation. The Company contended that Mr. Fownes was Manager, and that consequently Messrs. Dewar were liable. Mr. Chaldecott handed up the agreements made between Messrs. Dewar and Mr. Fownes; and the Bench, after reading them, decided that the claim must fail. Mr. Chaldecott applied for costs, which were not allowed.

A Gas-Cooker Canvasser's Claim.

A case was heard at the Southport County Court last week in which a man named George Barnes claimed from his late employers, Messrs. John Wright and Eagle Range, Limited, of Birmingham, the sum of £19 19s. 3d., made up of various items. These included a balance of agreed commission on orders obtained at Earlestown by the plaintiff as canvasser for the sale or hire of gas stoves, £5 8s.; balance of agreed commission on orders obtained at Southport, £9 11s. 3d.; one week's salary, £1; damages for breach of contract to employ plaintiff as canvasser, and estimated loss of commission for a week, £1 10s.; one week's wages in lieu of notice, £1; and estimated loss of commission for that week, £1 10s. Of this sum defendants had paid into Court £6 6s. and 8s. in aid of costs, leaving the claim at £13 13s. 3d. Mr. Jones, for the defendants, said his case was that the commission agreed upon was for orders obtained and executed; while the plaintiff maintained that it was to be reckoned on orders obtained merely. It was stated that in a large number of cases the orders were not executed, by reason of the fact that wives and daughters had given them, and subsequently the husbands had countermanded them. One witness said that in hundreds of cases at Southport children had signed orders on behalf of the fathers, who had afterwards repudiated them. Plaintiff alleged, on the other hand, that in some instances orders had been cancelled in consequence of a delay in supplying the stoves. After a long hearing, his Honour Judge Collier said he did not think defendants had acted at all unreasonably. The amount paid into Court was sufficient to satisfy the plaint; and he therefore gave judgment for the defendants, with costs.

A Troublesome Defaulting Consumer.

At the Mansion House last Wednesday, an Architect and Surveyor, carrying on business in Paternoster Row, was summoned before Alderman Crosby, by the Gaslight and Coke Company, to give evidence as to means to pay a gas bill of more than £5, in respect of which an order was made in June last. The Company's representative said the case was a bad one, as the defendant was still using the gas. Alderman Crosby asked why the Company did not cut it off. He said they had statutory powers to do so, just as the late Water Companies had. Witness: We cannot cut it off, because the defendant, who rents offices in a large building, will not let us enter his premises; and we cannot cut the gas off in the street, because by so doing we should stop the supply to all the other tenants in the house. The Alderman remarked that the Company's statutory powers were of not much use to them in this case. Witness said they could not enter his premises without the tenant's permission. He produced a letter from defendant, offering to pay the amount on Oct. 6; and a distress warrant was suspended till Oct. 7, when, in the event of the sum not being paid, and the goods not being of sufficient value to pay the debt, he will be committed to gaol for one month.

Alleged Thefts from Gas-Meters.

At the Worship Street Police Court, last Wednesday, before Mr. Cluer, John Cordwell, 22, a glass beveller, was charged, on remand, with having stolen various sums of money from meters belonging to the Gaslight and Coke Company. Mr. Humphries, Solicitor to the Company, said there were eight charges of stealing from automatic gas-meters entered against the prisoner; a large number of robberies having for months past been reported. It seemed certain that the person or persons concerned kept a systemetic watch upon the movements of people occupying small tenements or flats, which were invariably fitted with prepayment gas-meters. Frequently the tenant left without giving notice to the Company, and subsequently the meter was found broken open and the money gone. In six named cases the prisoner was identified by witnesses. Mr. Cluer considered three cases sufficient; and he committed the prisoner for trial.

Thefts from Prepayment Meters at Newport (Mon.).

At the Newport Police Court, on Friday, Robert F. Chester, a hammerman, was charged with stealing money from gas-meters in various houses; also with damaging the meters. An employee of the Gas Company gave evidence to the effect that when he went to one of the houses specified to clear the meter, he found it had been robbed of the 1s. 7d. it had contained. A police constable deposed to arresting the prisoner and charging him with the theft. He admitted it, and said he had been in the company of a man who had broken into about 50 houses in Newport. He pleaded guilty. One of the Company's inspectors said they had had considerable trouble through meter robberies; and he produced a written statement showing that the losses sustained amounted to £18. Mr. T. H. Hazell, the Secretary of the Company, said these organized robberies were of an extensive nature; as many as 85 cases having been brought to the knowledge of the Company. As the consumers were answerable for the losses, it was a great hardship upon them. Accused pleaded that he had been led astray by another man. The Bench committed him to prison for six months.

Refusal to Pay a Water-Rate.

At the Castle Eden Police Court, on the 17th inst., George Morris, of Hutton Henry, was summoned by the Easington District Council for the non-payment of 6s. 3d., the amount of a water-rate. Mr. Longden appeared on behalf of the Council; Mr. Geipel represented the defendant. The service of the demand note was admitted; and it was argued by Mr. Longden that whether or not the defendant used the water supplied by the Council, he was liable for the rate. Mr. Geipel said the claim was made under section 9 of the Public Health (Water) Act, 1878, which set forth that, a rural sanitary authority (in this case the District Council) having provided a stand-pipe for the supply of water to any portion of their district, they might recover the water-rate from any owner or occupier of a dwelling-house within 200 feet of the pipe, in the same manner as if the supply had been given on the premises. There was, however, a proviso that if such dwelling-house was within a reasonable distance of an alternative wholesome supply, the owner or occupier was to be exempt from the rate. Evidence was given to show that there was a stand-pipe 156 feet from Mr. Morris's house; but for the defence it was stated that in March last he gave notice that from the 31st of that month he would not require water from the Council, and that since then he had used the water from a pump some 460 yards distant, and for the last month from another nearer at hand. Dr. Arthur and Mr. Emery (the Sanitary Inspector) stated that analysis of the water from one of the pumps showed it to be polluted with sewage, and therefore not wholesome, as required by the Act. Mr. Longden explained that the District Council had for some time been desirous of closing the pump referred to, owing to the water being unwholesome, but had allowed the Parish Council six months' grace in the matter. The Magistrates decided against defendant on both points involved in the case, and made an order for the payment of the rate, with costs.

REGISTER OF PATENTS.

Explosion Engines.—Bickerton, H. N., and Bradley, H. W., of Ashton-under-Lyne, and Dugald Clerk, of Ewhurst, Surrey. No. 17,442; Aug. 11, 1903.

This invention relates to engines operated by the explosion of mixtures of inflammable vapour and air or inflammable gas and air, and is applicable mainly to engines intended to use heavy oil, in which the oil is vaporized by a hot surface forming part of the combustion space, and the mixture is also ignited by the heat of the combustion chamber or part of it.

The invention consists in providing a somewhat elongated water-jacketed combustion chamber, which preferably forms part of the engine casing. The chamber is fitted with an external cap or plate (not water-jacketed) heated initially in any suitable manner, and its heat maintained by successive explosions when the engine has started. The inlet and exhaust valves are placed within the water-jacketed portion of the combustion chamber; and the combustion chamber communicates with the motor cylinder by an aperture of relatively small diameter. The piston carries a plug which enters into this aperture at the in-end of the stroke; and a passage of small diameter passes from the annular space so enclosed through the combustion space, and terminates in a jet which impinges upon the hot plate or hot cap referred to. An important part of the invention consists in this arrangement for causing a rapidly flowing jet of air to strike the hot plate just at the end of the stroke. This jet of air striking the hot plate and mixing with the inflammable vapour near the hot part, "is found to act most effectively in timing the ignition and producing a powerful explosion of well-mixed vapour and air."

Cooling and Purifying Producer Gases.—Tweedale, E. & S., and Smalley, J., of Castleton, Lancs. No. 20,868; Sept. 29, 1903.

According to this invention the gas is led from the producer A by a pipe B entering a cylindrical chamber or tower C at a tangent, so as to give the gases a whirling motion and separate the dust and other impurities, which fall to the bottom of the chamber and are emptied when required. The chamber is separated into two compartments by a plate D, situated slightly above the pipe B. From the plate are suspended double or concentric tubes; and in the annular space between the tubes the mixture of air and steam is passed on its way to the producer from the air-tower E by pipes. The tubes are made shorter and smaller in diameter than the chamber C, to allow the gases from the producer to pass round the outside of each tube under the bottom end, and through the central space to the top part of the chamber; then down the outside of the double tube to a tangential opening F situated slightly above the plate D. From this opening, the gases may be passed by a pipe G through similar chambers to further cool and purify them.

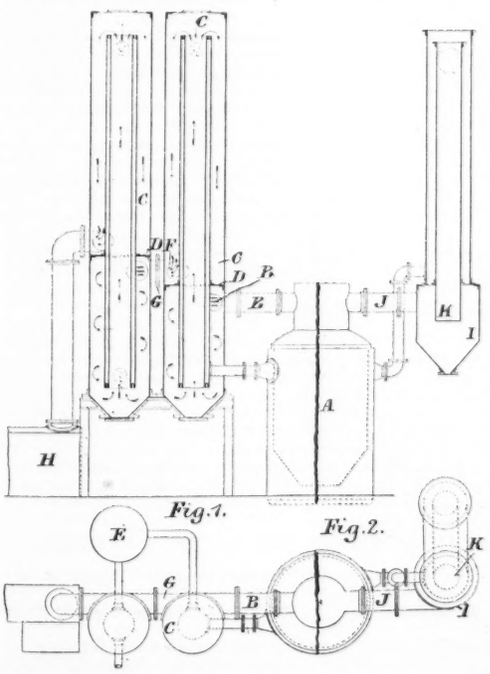


Fig. 1.

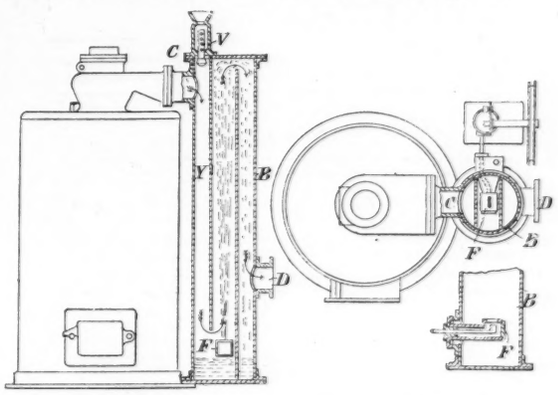
Fig. 2.

In the last chamber before the gas enters the washer or scrubber H, the water that is usually pumped from the settling tanks to the top of the air-heating tower E is passed by way of other pipes through the annular space between the double or concentric tubes—thereby further cooling the gases, and at the same time heating the water.

In applying the dust-collecting part of the invention to ordinary superheaters, an enlarged chamber I (see fig. 2) connects to the producer A by the pipe J, which enters the chamber at a tangent. Projecting a distance below this tangential opening, is the bottom end of the superheater pipe K. The gases from the producer enter the chamber I through the tangential opening in it, which gives them a whirling motion, and causes the dust to fall to the bottom of the chamber (from which it can be removed when required); the gases passing up the projecting superheater pipe, and then on through the superheater as usual.

Purifying the Gas of Gas-Producers.—Capitaine, E., of Frankfort-on-the Main, Germany. No. 2240; Jan. 29, 1904.

This invention consists in mixing the gas with a continuous and more or less constant quantity of air—the air serving, on the one hand, to convert the water into exceedingly fine spray, and, on the other hand, to rarefy the gas, and so diminish the deposits in the pipes. The quantity of air used is always in proportion to the quantity of the gas, and is only so large that the formation of an explosive mixture is not possible; thus completely eliminating the danger of explosion—it being borne in mind that producer gas has only a low calorific value, and is therefore rather voluminous. On this account, up to 25 per cent. of air may be forced into the purifier without danger of explosion.



The illustration shows a part sectional elevation of the apparatus, a part sectional plan, and a sectional view of the bottom part of the chamber B—at right angles to the other elevation.

C is the inlet for the gas from the generator into the purifying chamber B; and D the gas-outlet. The lower end of the chamber B is furnished with a diffuser F. The water enters the chamber through the opening shown, and the air through the pipe leading from an air-pump P, which is set in motion directly or indirectly by a motor, driven by the gas supplied by the generator. As the air-pump only forces air into the purifier when the motor is running—that is to say, when the latter takes gas from the generator—it is quite impossible for the pump to force air into the chamber without at the same time gas being also supplied. Thus the proportion between the gas and the air remains constant, and an explosive mixture cannot be formed.

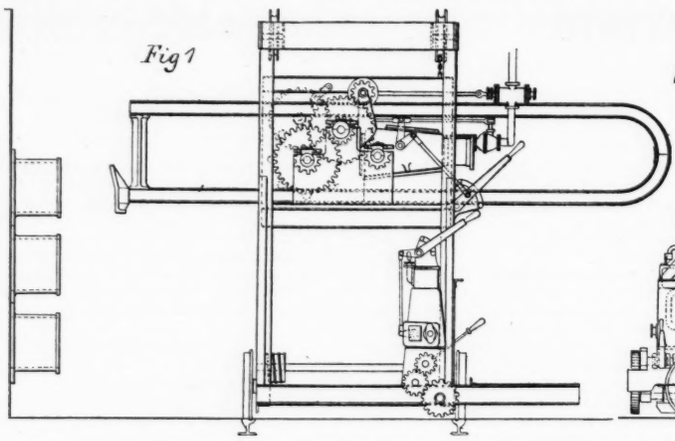
The air leaving the nozzle of the diffuser under an over-pressure of from 0·1 to 0·5 atmosphere, converts the water into an exceedingly fine spray, which is carried upwards in the shaft of the purifying chamber B. This upward motion, being in the same direction as that of the gas, helps to carry the gas forward, so that the particles of water remain for a considerable time in the closest contact with the gas. The gas is cooled in the shaft Y by the water entering at V, so that the purifying and cooling of the gas are separate.

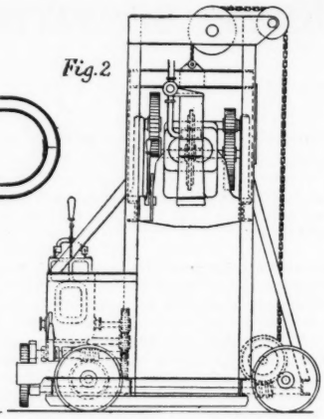
Discharging Machine for Gas-Retorts.—West, J., of Southport. No. 7288; March 26, 1904.

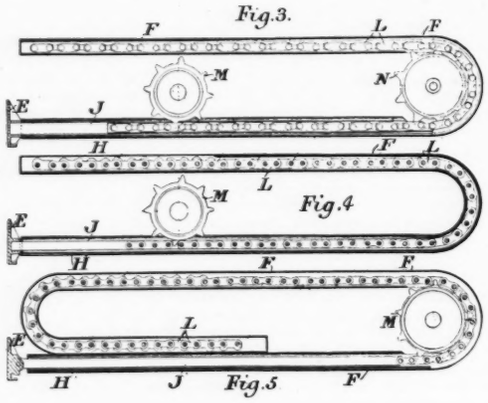
This invention relates to a telescopic ram forming part of a machine for discharging gas-retorts. It is constructed of several parts, which telescope into each other, so that the over-all length of the ram when out of the retort is less than when in the retort; and the parts forming the telescopic portion of the ram are extended to cause the head of the ram to make a stroke of sufficient length to enable the whole of the coke to be discharged out of the full length of the retort.

The ram consists of a stationary outer tube forming a track into which slides a part of the ram constructed of two lengths of channels parallel with each other, and forming a box into which slides a rod or bars carrying the ram-head, and having spaces or gaps between them to receive two feather strips which are attached to the inside of the stationary outer tube for the purpose of keeping a chain (hereafter described) rigid when the ram is being extended. To one end of the rod or bars which carry the ram-head is attached the end of a block-link chain, which passes round, or engages with, the teeth of a sprocket chain wheel placed in a fixed position on the machine. This wheel, on being rotated in one direction, drives the chain into, and along, the channel section or box tube; and the chain being attached to one end of the rod carrying the ram-head, pushes the rod or inner section of the ram, together with its head, forward—the rod sliding along the inside of the channel or box tube. When the inner section of the ram has made its full stroke along this tube, it engages into same, and the continued rotation of the sprocket driving chain wheel causes the chain to further push the inner ram forward and carry along with it the next section of the telescopic ram, until the full stroke of the ram-head is completed and the coke is discharged out of the retort. In order to bring the ram-head back to the machine after it has discharged a retort, the direction of the running of the sprocket chain driving wheel is reversed, and the chain is pulled in the opposite direction, when the telescopic parts of the ram close up into each other and into the stationary outer tube or track.

Fig. 1 (p. 890) is a side elevation of a discharging machine showing the general arrangement of the telescopic ram. Fig. 2 is an end elevation of the machine looking towards the retort-stack. Figs. 3, 4, and 5 show alternative arrangements of the telescopic rams, chain driving and guide wheels, and chain paths. Fig. 6 is a cross-section of







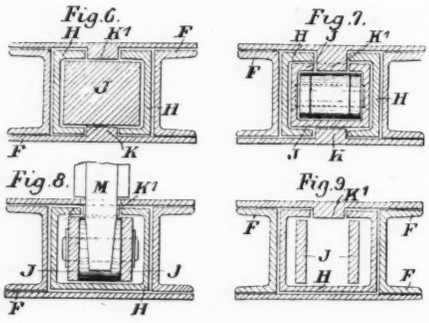


fig. 3 (through the fixed outer tube), showing the telescopic rams in same. Fig. 7 shows the chain connected to the rod or bars to which is attached the ram-head. Fig. 8 is a cross-section of fig. 4 (through the fixed outer tube), showing the telescopic rams and a portion of the sprocket chain driving wheel in gear with the chain attached to the bars, to one end of which is fixed the ram-head. Fig. 9 is a cross section of fig. 5 (through the fixed outer tube), showing the telescopic rams.

In the illustrations, F is the stationary outer tube which is fixed to the machine, and H the telescopic ram constructed of two lengths of suitable section parallel with each other, and forming a box into which slides a rod or bars J carrying a ram-head and having spaces or gaps between them to receive two feather strips K K^1, which are attached to the inside of the stationary tube. One end of the tube is curved over, as shown in figs. 3 and 4, and continued to the length required to store the chain; but it may be curved as shown in fig. 5 if desired. This continuation of the outer tube forms a box or tube into which the tail end of the driving chain L is stored when the telescopic parts of the ram are closed up in the outer tube. The chain is constructed of a block link with side links joined together with pins.

M is the sprocket chain driving wheel, gearing into the distance-blocks riveted between the bars J and the chain blocks. N is a guide chain wheel in the arrangement shown in fig. 3; the wheel being provided with sprockets or having a plain circumferential surface. This wheel is dispensed with in figs. 4 and 5.

The chain L is attached to the end of the rod or bars J, or it may be partly cased in by the rod J being hollowed out as shown in fig. 7. The chain may then be attached in any position in the length of the rod.

In discharging a retort, assuming that the rod J, ram H, and chain L are closed up in the fixed outer tube F, a rotary motion is given to the chain driving wheel M gearing into the block links, causing the chain to push the rod and head forward towards the retort. The ram H remains stationary until projections on it come into contact with projections on the ram, when the continued forward motion of the chain causes the ram to be drawn out of the fixed outer tube until at the end of the stroke it is prevented from leaving the tube by means of stops.

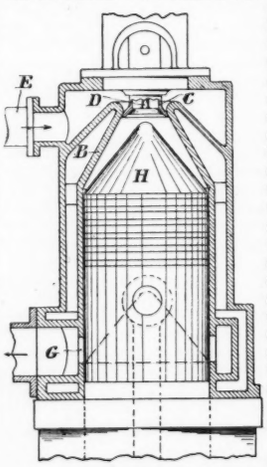
The chain driving wheel M is then reversed, and the rod closes up into the ram and pulls it into the outer tube. The tail end of the chain stores itself in the continuation of the outer tube, as shown in figs. 3, 4, and 5.

The object of the feather strips K and K^1 on the outer tube is to form guides for the chain blocks, and to keep the chain rigid when the ram is extended out of the tube. The tail end of the chain is provided with special side links (which are deeper), to take the place of the bottom feather strip K in the alternative arrangement, in which the ram is constructed of channel section, as shown in figs. 4, 5, 8, and 9.

The chain which pushes the ram forward and into the retort and drags it back into the tube on the machine is, it will thus be seen, always protected and kept rigid by being enclosed in either the telescopic parts of the ram or in the outer tube.

Internal Combustion Engine Working with a Two-Stroke Cycle.—Albertini, P., of Oberschan, Switzerland. No. 16,011; July 19, 1904. Date claimed under International Convention, Sept. 14, 1903.

The head of the working cylinder of the engine made according to this invention is of conical form, as is also the head of the working piston; the apex of the cylinder-head being made to constitute the seat for the valve of the scavenger air supply. On opening this valve, there is consequently produced an inflowing current of air which, without changing its direction, sweeps along the walls of the cylinder-head so as to drive the combustion gases in front of it to the discharge openings. The conical form of the piston-head is also made to constitute a favourable guide surface for the air current. By this arrangement, a very smooth and intense sweeping action of the scavenger air supply along the cylinder walls is said to be afforded; the air supply being made to enter under low pressure, and all change in the direction of the air current being prevented, "so that the possibility of the mixing of the scavenger air supply with the combustion gases that are driven out thereby is considerably reduced."



The engine-cylinder is shown in vertical section. It is constructed with a sharply conical head, constituting the combustion chamber B, at the apex of which is the seat of the valve C for the scavenger air supply. This valve is made of tubular form, and contains within it the inlet-valve D for the combustible. The head H of the piston is also formed conical. The valve C for the scavenger air supply is opened at the end of the expansion of the combustion gases; and the air entering through the pipe E drives the combustion gases out through the slots G, which are uncovered by the piston when it is in its lowest position, as shown in dotted lines.

APPLICATIONS FOR LETTERS PATENT.

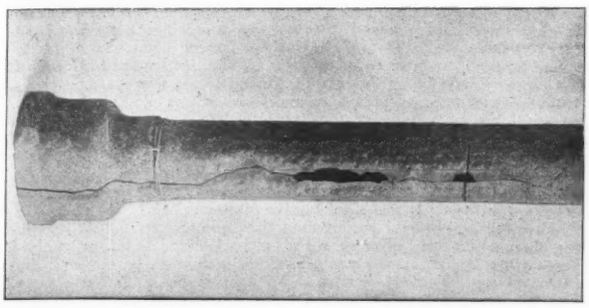
19,650.—Hignett, R., "Atmospheric burner." Sept. 12.
19,656.—Strain, J. J., "Gas-stoves." Sept. 12.
19,677.—Hutchinson, J., "Incandescent gas-lighting fixtures." Sept. 13.
19,754.—Steinicke, T., "Incandescent lamps." Sept. 13.
19,774.—Wilson, W., "Gas manufacture." Sept. 14.
19,782.—Dittlo, L., and Magnin, J., "Burners." Sept. 14.
19,819.—Tilley, C. G., "Bunsen burners." Sept. 14.
19,826.—Cash, J., "Gas-fires." Sept. 14.
19,827.—Cerasoli, A., "Gas-producers." Sept. 14.
19,830.—Spreadbury, R. J., "Inverted incandescence lamps." Sept. 14.
19,842.—Crossley, E., and Rigby, T., "Obtaining power from fuel gases." Sept. 15.
19,939.—Montgomery, W. S., and Macmillan, J. D., "Two-cycle internal combustion engine." Sept. 16.
19,974.—Gore, J., "Carburetting air." Sept. 16.
20,005.—Humphrey, A. H., "Gas-lamps." Sept. 16.
20,058.—Sharp, J., "Meters." Sept. 17.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Destruction of Mains by Electrolysis.

SIR,—I enclose a photograph of a water-main which was taken up in one of the principal streets in this town in July last. This is a clear case of electrolysis. The main was, I believe, laid immediately under the electric tramways here; but from what source the electricity came,



I cannot say for certain. The enclosed was reproduced from a photograph, and is rather indistinct; but should you care to make any use of it in the "JOURNAL," you are welcome to.

HAMILTON BAKER,
Assistant Engineer and Manager.

Reading Gas Company, Sept. 23, 1904.

The New Procedure of the Patent Office.

SIR,—In the "JOURNAL" for Aug. 23, an article under the above heading appeared; and the writer, in common with most other folk, jumped to the conclusion that the Comptroller of Patents has no power to reject an application for a patent if the search into novelty directed by the new Act discloses obvious anticipations of the invention claimed. But is it a fact that the Comptroller will not, after Jan. 1 next, have the power vested in him to refuse to grant a patent on that ground? The point seems to me to be open to question.

It is admitted that, under the present patent law and practice, the Comptroller may refuse to "accept" a complete specification, and, therefore, in effect refuse a patent if, in his opinion, "the invention is not a patentable invention." This practice originated from the fact that the Comptroller is not, under the present Patent Acts, "directed" to accept a complete specification, even when all formalities have been complied with—*i.e.*, "acceptance" is optional with the Comptroller, who (availing himself of the definition of the words "invention" and "alleged invention" to be found in section 46 of the Patent Act, 1883, and which is said to be "any manner of new manufacture within section 6 of the Statute of Monopolies") has, in such cases as were obviously not subject-matter for the grant of letters patent, refused to "accept." I refer to such cases as where application was made for a patent for combining an accident assurance policy with a pen-knife. Under the New Act, the Comptroller is specifically directed to "accept" when "he is satisfied that no objection exists to the specification on the ground that the invention claimed thereby has been wholly or in part claimed or described in a previous specification," and "in the absence of any other lawful ground of objection." In all other cases "acceptance" remains optional. In these circumstances, it seems quite clear to me that the combined effect of the old and the new laws (whether intentional on the part of the legislature or not, I cannot tell) is to bring British law, on and after Jan. 1 next, into line with that of the United States, Germany, &c., in that it will be the duty of the Comptroller to refuse to accept (equivalent to the foreign "rejection") in all cases where the official search discloses a clear anticipation, since the "alleged invention" obviously is not "a manner of new manufacture," and therefore is not a patentable invention.

As has frequently been pointed out when dealing with foreign laws, justice is not always obtained by inventors when their interests are left in the hands of Patent Office officials to decide what does or does not constitute "anticipation" or "invention." These points frequently sift down to apparently minute, but possibly all-important, differences regarding the value of which the most technical and competent minds may differ—such, for instance, as the case to which you refer, of the German refusal to grant a patent on the Welsbach burner, and which it is now universally admitted ought to have been granted. In England, if my interpretation of the law be correct, inventors will probably frequently find themselves at variance with the Comptroller, and will be compelled to appeal to the Law Officer, who, though invariably the most competent lawyer, rarely professes to have mechanical, chemical, or scientific knowledge. This hardly seems the most desirable ultimate Court of Appeal for such cases.

Sept. 12, 1904. A. F. SPOONER.

Mr. D. Irving, of Bristol, writes: "There is a slight error in your otherwise very accurate report of the remarks made by me at the Glasgow Corporation banquet in your last issue—lines 24 and 25. I did not use the word 'fallacies.' What I said was: 'I would not in that Municipal Community say failures.'"

MISCELLANEOUS NEWS.

THE WELLINGBOROUGH NEW GAS-WORKS.

Inauguration Proceedings on Thursday.

In the last issue of the "JOURNAL," a full description appeared of the latest enterprise on the part of the Wellingborough Gaslight Company; and this week we have to chronicle the ceremony in connection with the inauguration of the new works, which took place on Thursday. This, too, included a reception by the Chairman and his co-Directors of the Company, and an inspection of the works, closing with a banquet. Nothing was lacking on the part of those responsible for the arrangement of the proceedings to make the day a memorable one to all concerned—the only disagreeable factor being the weather. Visitors arriving at either railway station found vehicles waiting to convey them to the works situated in the Union Road; and a short walk through the entrance-gates brought the visitors to the well-appointed offices, which had been temporarily turned into a reception-room. Here the Chairman of the Company (Mr. David Dulley, J.P.), the Vice-Chairman (Mr. J. T. Parker), Mr. Frederic Gravely, Mr. J. Heygate, Mr. C. L. Welldon, and Mr. W. Wyldes extended a cordial welcome to the visitors. The Wellingborough Volunteer Band was present and played selections of music. In addition to shareholders, a number of gentlemen representative of the gas industry had been invited.

After an inspection of the works in all departments, the visitors sat down to a splendid repast. The chair was taken by Mr. D. Dulley. The company, which included a fair sprinkling of ladies, numbered 150. The subsequent toast-list was a lengthy one; but we shall only notice the speeches of more immediate interest to our readers.

Mr. D. MACFIE gave "The Wellingborough Gaslight Company;" remarking that the story of the Company, as told by the excellent Secretary (Mr. Kimbell) was one long record of successful local enterprise, credible alike to the community, the shareholders, the Directors, and the management. He had known the operations of the Company for over twenty years, and had never ceased to admire the progressive policy of the Directors and the earnest efforts of the officials; and the only section of the Wellingborough community whom he had envied were the fortunate shareholders of the Company. During these years, the Company had grown from strength to strength; and to-day they had witnessed with unstinted admiration the latest developments on the ideal site whereon they were worthily celebrating a notable achievement in gas engineering. The honours of the day rested with the Company's capable Engineer, whose modesty was in strange contrast to his ability, and whose past and present achievements exhibited the fine combination of caution and courage which were so characteristic of the man. The choice of Mr. Lewis as Manager twenty years since, reflected the wisdom of the Directors and of the late Chairman (Mr. Woolston), whose ripe experience and sagacity they remembered that day. Their wise choice of an Engineer recalled that of the Vicar of Wakefield, who told them that he chose his wife as she chose her wedding gown, not for the gloss upon its surface, but for such qualities as would wear well. The Company's success had been built up on the shrewd, far-seeing policy of the Directors, who had wisely chosen their officials from time to time, and had wisely retained them, and with equal wisdom had trusted them wholly. Many present would also agree with him when he suggested that, if responsible officials could not be trusted all in all, they had better not be trusted at all. Evidence of the far-sighted policy of the Company could be traced in Mr. Kimbell's record also. After a kindly reference to the presence of Mr. F. Gravely (one of the Directors), who remembered the starting of the Company in 1833, and to the late Mr. W. Woolston, and the part they had taken in the continuous progress of the Company, Mr. Macfie said he found that in the year 1833 there was 20 per cent. allowed off the half-yearly payment—presumably in advance; and very soon after the favour of gas by meter was conceded to good customers. As early as 1840, Wellingborough was the pioneer of differential rates—by the introducing of cooking by gas at a charge of 15s. per 1000 cubic feet, as against 30s. for lighting. Another notable feature of the Company's policy was that of working up to specification in the matter of quality, and, indeed, supplying gas of at least one candle higher than the limit—an example worthy of imitation. But, further than all this, the Company had never been content simply to sell gas without regard to its proper use; and the controlling hand was seen in the conditions in force for ten years after the Company's inauguration, when they insisted upon carrying out the consumers' gas-fitting. That early condition had been very properly relaxed; but the underlying idea had not been departed from, because the fittings department had been so wisely and progressively controlled that the popularity of gas in Wellingborough at the present time owed much to the supervision which was exercised in Mr. Kimbell's department as to the proper and economical use of gas by the consumers. The policy which underlay this active interest in the proper use of gas largely accounted for the enormous expansion of business during the past twenty years—showing an increase of over 100 millions on an output of 30 million cubic feet in 1884. It was the fashion twenty years ago to sneer at the pretensions of electricity as a lighting agent. Fortunately this was no longer so; and it was just as well that the easy-going monopoly of gas making was rudely disturbed by the electric shock which roused the sleeping energies of the gas world into an active and progressive crusade, which had given it new worlds to conquer. He supposed that in these past twenty years there had been more progress made in the manufacture and use of gas, and more capital profitably expended in the erection of up-to-date works, than during the forty preceding years; and the end was not yet. They in Wellingborough had done their part; and they who had that day admired their enterprise and enjoyed their hospitality wished them most heartily a continuance of the great prosperity they had so well deserved. He coupled with the toast the name of Mr. Dulley, the Chairman of the Company, and their presiding host, who had given proof, if such were needed, that

he was the right man in the right place in guiding the destinies of this flourishing Gas Company.

The toast having been heartily drunk,

Mr. DULLEY, in reply, said that in February, 1903, the Directors issued a letter to the following effect:—

> Your Directors have been, for many years, considering the question of railway communication with the works; so that the coal and other materials required in the manufacture of gas might be delivered into the works, and the coke and other residual products sent out without further handling and expense. The tonnage of coal and other materials is increasing every year. During the past year, we received into the works 13,000 tons of coal and other materials, and sent out 7500 tons of coke and other residuals, the bulk of which was carted from or to the railway-stations. When the new works are complete, the whole of the gas will be made and purified there; the existing works will be retained as a storage and distributing station. The Midland Railway Company are constructing the necessary siding between their station and the works; and this we hope will soon be ready for use. It is estimated that the total cost of the new works—inclusive of land—will be about £29,000, of which sum £18,000 is to be found by capital and £11,000 by revenue. The saving to be effected by having railway connection with the works, based on the present tonnage of coal and other materials, is £718; and as there is an abundant supply of water on the site, we estimate that a saving of at least £90 per annum will be made on this item alone, as only drinking water will be required from the town supply. These sums, with the rent received for the land not needed at present for the works, will effect a total saving of £849, which is sufficient to pay over 4½ per cent. interest on the capital expenditure required for the new works. This knowledge enables your Directors to face what would otherwise be a very serious responsibility, with equanimity and with full assurance of the success of their new departure.

Continuing, Mr. Dulley said the shareholders had now had an opportunity of viewing the works completed; and their opinion was that they fully came up to their anticipation. The trade of the country was, as they were aware, in a very depressed condition, and especially the staple trade of their locality. But, in spite of this, the Company were able to pay the same dividend as in previous years. With the revival of trade, all stocks would rise throughout the country, and gas stocks with them. The Directors would not have any fear of the electric light superseding gas, as the former was getting more complicated, while the incandescent gas-light was getting more simple. He was glad to see such a large gathering of shareholders; and he felt that he could say without exaggeration that their property in the Company was safe. They had works which were quite up-to-date to-day; and no works at present erected in this country could compete with them in the economical production of gas.

Mr. WILLAN JACKSON, in giving the "Town and Trade of Wellingborough," said that, at the same time that the enormous improvements had been taking place in the operations of the Gas Company during the last half century, a corresponding improvement had also been taking place in various departments of the town.

Mr. G. LAWRENCE (the Chairman of the Wellingborough Urban District Council), in reply, said that in these days—when so much was heard of municipal trading, and the advisability of the management of all such works as public water supply and public lighting being in the hands of local governing bodies—there were probably some who would not welcome the important new works they had seen that afternoon, inasmuch that they might seem to place the realization of their hopes further off than before. But this was a subject of such a debatable character that he would not speak upon it then. His duty was of a more agreeable nature than to discuss problems of this sort; for in congratulating the promoters of the undertaking upon the step that had been taken, he did so with satisfaction, because the very fact of their establishing new and extended works proved to them that there were people who did not believe the croakers who were saying that Wellingborough had seen its best days. The relations between the Gas Company and the District Council were necessarily of a very close nature; and as a member of the Council he was glad to bear testimony to the fact that, in the many transactions that had taken place between that body and the Company, good feeling had always prevailed, and this he hoped would continue.

Mr. J. T. PARKER submitted "The Officers of the Company—the Secretary and Manager." He said that Mr. Kimbell had had considerable experience; and the Directors had found him of great assistance. Then as to the Manager, Mr. Lewis, that really was his day; and he was entitled to be proud of it. When works of this magnitude were taken in hand, a considerable responsibility rested with the Directors; and to see their joyful countenances now, the shareholders would not believe it if he told them that they had had any anxious moments. As Directors, they had felt that they were the trustees for the shareholders; and they did not want to be connected with anything that was likely to be a failure or by which they would lose money. For many years the change of site had been talked about; and before he became a Director he was convinced of the unworthiness of the old site. The question later on became acute; and after taking the advice of their Manager, they adopted the new site. They had good reason to believe that the advice which Mr. Lewis gave the Directors had been sound; for he was a man who had had larger experience in these matters than many of them were aware. It was written of a celebrated architect whose bust was placed inside a magnificent building: "If you want to see his monument, look around." So he (Mr. Parker) might say that if they wanted any evidence of the skill and ability of Mr. Lewis, let them look around. He (the speaker) hoped this was not going to be his last monument, but that it would be an incentive for him to do better things if possible. He had been told by persons of experience in the gas world that these works were a credit to Mr. Lewis, and were model works, and embodied improvements which were not seen anywhere in the county or in any adjoining county. The Directors had placed the utmost confidence in their responsible officers, whose advice they had taken at every possible point. When Mr. Lewis put his plans before them, the Directors were not shy in asking questions; but they had not gone outside his advice, and had not called in any other expert. The Directors did not take any credit for the works, beyond adopting the advice of those who knew better than themselves. There had been no loss to the shareholders. As a matter of fact, the new works had actually begun to earn their money and were paid for as well, and the shareholders did not know it.

The toast having been musically honoured,

Mr. LEWIS was the first to reply. He thanked them all very sincerely for the way in which they had received the toast. He had been asked by various people why the works had been built, and had heard several reasons given; but none of them were his reasons. It was 21 years since he was appointed Manager. At that time (1883), the total sales of gas amounted to 24,618,000 cubic feet; and for this they used 3021 tons of coal. The capital of the Company was £7 2s. for every ton carbonized. Gas was then sold at 3s. 6d. per 1000 cubic feet; now it was 2s. 9d. The Company went on in a very successful way until 1896; and then he had to make a report to the Directors as to extensions needed. There arose a point over which there had been many inquiries—Why, in 1896, he did not foresee what was going to happen? Well, he must confess that he could not see the business of the Company growing in the way that it did in the few years succeeding 1896. The figures for 1895 were: Sale of gas, 59,813,000 cubic feet; coal carbonized, 6177 tons; capital, £6 13s. per ton carbonized. When he considered what was to be done, he did not feel warranted by a long way in recommending the Company to remove the works from the then existing site. Three years ago, however, they found that things had moved very rapidly, and they had to consider further extensions. It was a very grave matter to him; and he had to decide whether he should recommend the Directors to further extend their plant on the then existing works on the London Road, or go elsewhere. After most carefully considering the matter, he came to the conclusion that his duty was as plain as possible, and that was to recommend the Directors to secure a new site, which was the one on which the present works were built. He could not say how well the Directors received his report, and secured the site almost without any delay whatever, and resolved to do the work. He was very much touched by the trust and confidence which they had reposed in him. Mr. Lewis pointed out that owing to the enormous sums they were paying prior to the new works for cartage, and the fact that the cost of getting a siding from either of the two railways was prohibitive, and the fact, too, that the sales of gas had risen from 59 million cubic feet in 1895 to 131 millions last year—having more than doubled in that period—he had no other course but to recommend the scheme that he did. It was gratifying to find that though in 1896 the amount spent was £6 13s. per ton of coal carbonized, it was only £6 10s. now, which showed that, in spite of spending this large amount on the new works, the cost per ton was less. He had to thank Mr. J. W. Fisher for assisting him in the works, in preparing plans of the buildings, and for getting out quantities and specifications. He had also to thank Mr. Watson, his Assistant, for his ready help and the long hours he had spent in helping him to prepare the plans. They had had an anxious time in 1903, when they had had a number of floods to contend with at the site. The land there was subject to floods. But they had increased the level of the works; and so far as the floods were concerned, he thought he could promise that they would be free from any bad effects. Having thanked the foremen and workmen, Mr. Lewis said he had received great assistance from some of the Contractors; and to his friend Mr. West he offered his sincerest thanks. That gentleman had materially helped him as to the construction of coal and coke plants; and one of the greatest successful things was his charging and drawing machine. He could not let the opportunity pass without saying how proud he was to be the first to give an order for the charging-machine of the combined pattern, which did its work so splendidly and so economically. He had also to thank his friend Mr. Dempster, and the local Contractors too. He was also indebted to Mr. Kimbell for the ready help that he had always rendered him in devising ways and means to meet the big batch of bills that he had handed over to him. He was also under an obligation to the technical papers, and especially to the "JOURNAL OF GAS LIGHTING," whom he wished to thank most heartily for the splendid account given of the works.

Mr. KIMBELL said this was the largest meeting of shareholders of the Wellingborough Gas Company that he had ever attended. It was with great pleasure that he had drafted the circular calling the meeting; and he could not help thinking that it was 31 years that week that he had to send out a circular which was unique in his experience—and that was a notice to consumers in Wellingborough of an advance in the price of gas. It was an increase of 5d.—from 5s. to 5s. 5d. per 1000 cubic feet. Since then, however, there had been gradual reductions; bringing the price down to 2s. 9d. per 1000 feet. The Company never went back; and he had not the slightest fear of the future of the concern.

Mr. J. W. FISHER gave "The Contractors," and said he had been particularly struck with the West machinery in connection with the charging of the retorts; and this appeared to him to be something that had never been attempted before. He was glad, too, that here they had something which was made by an English firm. Mr. Dempster and the local Contractors had all done their work well.

Mr. WEST, in reply, said it was a great pleasure when contractors had to work for a company engineered like theirs was at Wellingborough. They were governed by good business men who understood their profession, as also did the Engineer. The Directors' confidence in Mr. Lewis had not been misplaced. The site was an excellent one; and there would be a lot of collateral advantages which would arise from the scheme. Theirs was the first Company to adopt his (Mr. West's) combined charging and drawing machine. There were no other works in the kingdom that were carbonizing coal so cheaply in works of this size as they were doing at Wellingborough. He challenged anyone to refute the statement he made, either in England or on the Continent.

Mr. ROBERT DEMPSTER also added his congratulations to Mr. Lewis and the Directors, and said, after witnessing these automatic gas-works, it seemed to him more like the realization of a fairy story than the actual handling of coal and coke.

The proceedings shortly afterwards terminated.

PRESENTATION TO MR. JAMES PYE, OF CHESTER.

Half-a-Century in Office.

Last Thursday, the fifty years' service of Mr. James Pye, as Secretary of the Chester United Gas Company, was suitably acknowledged by the Directors, officials, and workmen, at a meeting held in the Board-room, at which a presentation was made to him. Mr. John Gamon, the Chairman of the Company, presided; and there were also present Messrs. Frost, Birch, Okell, and Hobday (Directors), Mr. Fred A. Pye (Secretary), and Mr. J. C. Belton (Engineer).

The CHAIRMAN, in opening the proceedings, said the Directors had had the pleasure of making known to Mr. Pye, by letter and by resolution which was entered in the books of the Company, their high appreciation of the zeal and ability with which he had conducted the affairs of the Company as their Secretary for the past fifty years. They had that day a more pleasing duty to perform, and that was to present to him, on behalf of the Board, the officials, the clerks, and the workmen employed by the Company, a substantial reminder of that appreciation, and their sense of the kindness and consideration he had shown towards all with whom he had had to deal. It would be gratifying to Mr. Pye to know that the pieces of plate they were asking him to accept had originated from a spontaneous wish of those employed in the offices and on the works to mark in this way their recognition of his kindness. They wished him long enjoyment of the leisure he would obtain by his retirement, and hoped he might hand down to his family a mark of the respect and esteem of those with whom he had been most intimately connected, so that they might be reminded that their father was a man of ability and worth. Personally, he wished Mr. Pye a long continuance of a happy enjoyment of his retirement.

The Chairman then presented to Mr. Pye a handsome silver tea and coffee service on a silver-mounted tray; one of the articles bearing the following inscription: "Presented to Mr. James Pye, on his retirement from the Secretaryship of the Chester United Gas Company, by the Directors, Officials, Clerks, and Workmen of the Company, as a token of their respect and esteem, June 30th, 1904."

Mr. PYE, who had a hearty reception, said he rose with feelings of profound thankfulness for the very valuable mark of esteem and respect he had received. To him it was a very great pleasure indeed to have presented to him such a very handsome testimonial to a life-long servitude in connection with the Chester United Gas Company. He felt that this was the first opportunity he had had of saying how extremely grateful he was to the Chairman and Directors for the liberal way in which they and the shareholders had met him with regard to his retirement from the Company's service. He had also to acknowledge the kindness and sympathy of the Chairman, both by letter and by a handsome present to him just before he retired, by means of which he was constantly reminded of the very pleasing relations which existed between them. He was greatly obliged to Mr. Gamon, and he cordially thanked the Directors for the kind and sympathetic way in which they had always met him, and listened to anything he had to say. The present seemed to him to be a unique one, because it came to a man who occupied rather an awkward position in some respects. He was the middle-man between the head of the concern and the workmen. For fifty years he had sustained this position—recently not so closely as in former years, when the offices and works were combined on one side of the Roodee. Then they all knew him almost as a brother and a friend. In later years they had hardly seen him, and many of them might scarcely have known him. Those in the office knew him well, and that they should have a kindly feeling towards him was only in accordance with his opinion, as he had always experienced the utmost good-will on the part of every officer. The Directors were always anxious, in their dealings with the organization as a whole, to act on the principle of doing justly by all their officials. No doubt the position might lead in some cases to a little harshness, from want of sympathy. But this had never been the case in connection with the Chester Company; and it had been a pleasing duty to him to carry out their wishes. Now that he was getting old, his son was taking his place. He would be a better man for the position than his father had been, who had had to grow into it. His successor, however, had been educated for it; and it was a very great pleasure to him that he had, so early in his career, obtained the confidence of the Directors. His last words to them were that he most heartily thanked them all for their consideration, their sympathy, and their great kindness in contributing towards the valuable present they had made to him.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented to the shareholders of the above-named Company at their half-yearly meeting next Friday, the Directors state that the working in the six months ending the 30th of June resulted in a gross revenue of £148,382, and an expenditure, including the interest paid on debentures, of £117,982; leaving a balance of £30,400. Adding the balance brought forward (£9842), the sum available for distribution is £40,242; and the Directors recommend the payment of the usual dividends at the rates of 10⅝ and 7½ per cent. per annum on the respective shares. These will absorb £35,203, and leave £5039 to be carried forward. The price of gas was reduced 2d. per 1000 cubic feet at the beginning of the year; and the Directors point out that by this concession the consumers have benefited to the extent of £12,500 per annum. Though the report is dated the 21st inst., no reference whatever is made to the death, on the 21st ult., of the Company's Engineer, Mr. E. H. Waterfield, who had been in their service upwards of forty years, for thirty of which he held the position he filled at the time of his decease. The accounts accompanying the report show that the total revenue was made up principally of £105,022 received for gas used for public and private lighting, £3484 for the rental of ordinary meters, £15,595 from prepayment meters, and £23,906 for residual products. The chief items of expenditure in the half year were: Manufacture of gas, £73,505 (coal costing £27,749, and cannel and oil £24,036); distribution, £21,822; management, £5286; and rents, rates, and taxes, £4279. The quantity of raw material carbonized was 40,694 tons of coal, 1275 tons of cannel, and 1,350,809 gallons of oil; and the bulk of gas produced was 810,383,000 cubic feet, of which 715,563,000 cubic feet were sold and 722,635,000 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 52,108 chaldrons; breeze, 4144 chaldrons; tar, 580,688 gallons; and ammoniacal liquor, 853,789 gallons.

SHREWSBURY GAS COMPANY.

The Annual General Meeting of this Company was held at the Offices, Pride Hill, Shrewsbury, last Wednesday—Mr. W. BEACALL (the Deputy-Chairman) presiding in the absence of the Chairman, Mr. J. Spencer Phillips.

The report presented by the Directors showed that the profit on the year's working amounted to £8182. An interim dividend of 2½ per cent. was paid in March last, and £800 had been set aside to meet a deficiency in the reserve fund, caused by the great depreciation of Consols. The Directors recommended that the authorized dividend of 5 per cent. for the year should be declared, after providing for which, and for interest on mortgages, there would be a balance on the profit and loss account of £1563 to be carried forward. The reserve fund amounts to £8631, and is fully invested in Consols. There was an increase of 10½ million cubic feet in the consumption of gas during the year. The unaccounted-for gas was further reduced from 5·78 to 4·704 per cent.; and the quality of the gas was maintained above the parliamentary standard. The new works were completed and put into operation on the 24th of November last; and the Directors stated that, so far, they had fully realized the expectations formed of them. Increased consumption, improved working, and favourable coal contracts had allowed of a reduction of 2d. per 1000 cubic feet in the price of gas, taking effect from June 30. The number of stoves on hire at that date was 1920—an increase of 314 in the year; and the number of slot meters in use was 2561, being an increase of 291. The demand in both departments continues.

The CHAIRMAN, in moving the adoption of the report, said it was so very satisfactory that it required few words from him. It gave a very good outline of the Company's position on the 30th of June last, and the progress made during the past year; while the accounts showed how substantial that progress had been, and bore unmistakable evidence to the Company's vitality and prosperity. The result of the policy of the Directors in providing additional works of the most modern and economical type had been very satisfactory, and had more than justified the high expectations they had formed. If any justification was needed of the wisdom of this policy, it was plainly shown by the fact that, after earning full dividends and interest upon the whole of the stock and loans, including the large amount raised for the new works—and it must be remembered that these works had only been in operation during less than eight months of the year—the Directors were able to apply £800 to meet the deficiency in the reserve fund arising from the continued depreciation of Consols, in which it was invested, and to carry forward an additional £422 on the profit and loss account. It might be of interest to mention in regard to the reserve fund, that it had attained to its full height. The report told them that the factors contributing to the highly satisfactory position of the Company were, first, increased consumption, which amounted to 10½ million cubic feet of gas in the year; secondly, improved working, which would be apparent when they knew that while the extra quantity of coal carbonized was 4·38 per cent., the increased production of gas was 5·49 per cent., and the increased sale 6·53 per cent.—the unaccounted-for gas being further reduced by upwards of 1 per cent. In addition, there were substantial decreases in wages and other items, and a large increase in the returns from gas and from residuals, particularly coke. The third factor was their favourable coal contracts. This item, of course, was not one over which the Directors could exercise much control. They bought in the best market they could find; but for a number of years, until recently, prices had been very variable. Naturally, the cost of coal being by far the largest item in the Company's expenditure, the price to be charged for gas and the amount of profit made must always be affected by the condition of the coal market, which at present was favourable for the production of cheaper gas, and it was to be hoped might continue to be so. The shareholders would see that each of these factors had contributed to make the past year one of the most prosperous the Company had ever had; and the Directors were glad to be able to share the prosperity with the consumers by making a reduction of 2d. per 1000 feet in the price of gas from the 30th of June last—thus remitting to them for the current year the substantial sum of about £1500. They trusted the result would be to further stimulate the consumption of gas, which, for all domestic and trade purposes, and especially when used for lighting with incandescent burners, could not be surpassed for efficiency and economy.

Dr. CALVERT seconded the motion, and it was carried unanimously.

The dividend recommended having been declared, and the retiring Directors and Auditor re-elected, a hearty vote of thanks was accorded to the Chairman and Directors for the care and attention they had bestowed on the affairs of the Company.

The CHAIRMAN, in acknowledging the compliment, said it would be idle to say that there had been no care and responsibility about the works for some time past, because an extension had become a necessity; and it was a very happy thing that they had Mr. Belton at their right hand, and had been able to carry out large and important works in a way which had been very conducive to the present prosperity of the Company, and would materially help to ensure its prosperity in the future.

Dr. CALVERT, in proposing a vote of thanks to the Engineer and

Secretary, said Mr. Belton had been with the Company 25 years; while he (Dr. Calvert) had served a little more than this period. He had always derived the liveliest sense of satisfaction from his association with Mr. Belton; and he considered the Directors were greatly obliged to him, particularly with regard to the extensions of works. The first considerable enlargement for which they were indebted to him was the big gasholder, which was constructed entirely from his designs. Coming to the present time, they had the labour-saving apparatus which he had designed and which had been carried out under his direction by Messrs. R. Dempster and Sons—a most important step in the history of the Company. The new works had recently been visited by a number of gas engineers, principally from Oldham; and he believed they were thoroughly satisfied with all they saw.

Mr. T. F. Poole seconded the motion; and it was carried.

Mr. Belton, in acknowledging the compliment, said the 25 years he had been in Shrewsbury had been years of a good deal of work and anxiety; but he had had such pleasant relations with the Directors, and they were so capable of looking after the affairs of the Company, that it had been a great satisfaction to work with them, and had made the period of his service one of enjoyment and of hopes of further improving the position of the undertaking. These hopes, he thought, had been realized by the last great move the Directors had made in building new works, the effect of which they already saw in the balance-sheet. It was also a great pleasure to him that the business was so prosperous that the Directors had seen their way to make a substantial concession to the consumers. The more they could do in this way, the more their own prosperity was likely to increase. Mr. Belton referred to the excellent services rendered by the various members of the staff; and, in conclusion, said he hoped to continue to work for the Company for some years to come.

TORQUAY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday—Mr. W. B. Beynon (the Vice-Chairman) presiding, owing to the recent death of Mr. W. H. Kitson, the Chairman.

At the outset of the proceedings, reference was made to the loss which the Company had sustained by the death of Mr. Kitson, and also by the death of Mr. H. A. Willey, who was a shareholder and frequently attended the meetings of the Company. A vote of condolence with the family of Mr. Kitson was passed; and it was mentioned that the Directors had long had the desire to hang a portrait of the late Chairman in the Board-room opposite to that of his father, who had also been Chairman of the Company. Sympathy was likewise formally expressed with the family of Mr. Willey.

The Chairman, commenting upon the accounts for the six months ending the 30th of June, said the receipts amounted to £16,869, and the expenditure was £13,291; showing a surplus of £3578, of which the dividend would absorb £3536. The revenue from the sale of gas was £642 less than in the corresponding half of last year, owing to the reduction of 3d. per 1000 cubic feet in the price. The sales had, however, increased by 1,700,000 cubic feet; and it was gratifying to the Directors to be able to show a surplus after conceding practically £1000 to the consumers. An increased day consumption had been stimulated by the reduced price of gas and the low charges made for the hire of stoves. Payment of the full dividends of 10 and 7 per cent. on the different classes of shares was authorized; but on this occasion they would be less instead of free of income-tax, as of old, consequent upon the judgment given in the case of the Ashton Gas Company.

The dividends having been declared and the other business disposed of,

Mr. Aitken said it was the wish of the shareholders that the office of Chairman of the Company should be filled by Mr. John Kitson, the Secretary, the brother of the late Chairman.

The Chairman said no meeting of the Board had been held to consider the question of the late Mr. Kitson's successor; but he hoped they would be able to adopt the suggestion, and thus continue the name of Kitson in connection with the chairmanship.

HALIFAX CORPORATION GAS DEPARTMENT.

The Operations of the Tar Works.

In last week's number of the "Journal," some figures were given relating to the working of the Halifax Corporation Gas Department for the past financial year; and in the course of the article, reference was made to the operations of the tar works. No details, however, were furnished; and opportunity may therefore now be taken to notice a little more fully this interesting branch of the undertaking. In the first place, the period of working covered by the accounts was only nine months—from July 1, 1903, to March 31, 1904. The value of the tar taken over is stated as £3129 18s. 5d.; and working expenses (including the first instalment—one-third—of the royalty for a Lennard still, £291 13s. 4d.) came to £1638 12s. 3d.; making a total of £4768 10s. 8d. As against this, there was an income of £2188 10s. 1d., made up as follows: Pitch, £1686 2s. 3d.; creosote, £337 0s. 5d.; naphtha, £48 1s. 10d.; benzol, £5 16s. 8d.; heavy oil, £19 17s. 4d.; brick oil, £25 9s. 7d.; prepared oil, £31 16s. 5d.; disinfectants, £20 8s. 6d.; black varnish, £9 6s. 11d.; and casks and packages, £4 10s. 2d. Adding to this the value of the stock on hand, £2562 1s. 8d., made a total of £4750 11s. 9d., which, it will be seen, practically balanced the amounts for tar and working expenses standing on the expenditure side of the account. There was, however, also charged against revenue three years' sinking fund £416 14s. 9d. and three years' interest on capital £1078 11s. (which sums were transferred from the gas-works revenue account); and it was the addition of these two items that resulted in the balance on the wrong side of £1513 4s. 8d., to which reference was made last week.

LEWISHAM BOROUGH COUNCIL AND THE SOUTH SUBURBAN GAS COMPANY.

The Illuminating Power and Purity of the Gas.

The Lewisham Borough Council at their Meeting on Wednesday received a report from the Gas Examiner, stating that on the 30th ult. he tested, at the Company's works in Lower Sydenham, the gas supplied by the South Suburban Gas Company, and found that the illuminating power was 14·18 candles, that there were 34·51 grains of sulphur in 100 cubic feet, and there was no sulphuretted hydrogen. The Forest Hill and Sydenham Committee presented the following report on the subject: "The illuminating power prescribed by the Company's Act is 15 candles; consequently the gas on the 30th of August was deficient in that respect to the extent of 0·82 candle. The maximum of sulphur permitted in the gas is 20 grains; and sulphur was therefore in excess to the extent of 14·51 grains. The Company's Act of 1893 provides that no forfeiture shall be incurred in any case with respect to which it is proved before the Justices that the defect in illuminating power or excess of impurity was occasioned by unavoidable cause or accident; and in the case of an excess of sulphur, unless that excess shall amount to 2 grains upon the average of six consecutive week days, or 10 grains upon any one day. It is therefore clear that the Company are liable for penalties both in respect of the illuminating power and the purity of their gas on the day of examination. The Company recently issued a circular to their consumers in which they intimated that the standard illuminating power and purity would not be maintained by them; and they put it on the ground that the deficiency would arise in consequence of the action taken by this Council in regard to the nuisances caused by the Company in the manufacture or purification of the gas. The action taken by the Council with regard to the serious nuisances caused by the Company was amply justified by the result of the proceedings taken; and there does not appear to be any ground whatever for permitting the Company to supply gas of less power and purity than that required by the Statute, or permitting them to break the law in the manner in which they indicate their intention to do. The Committee therefore recommend that proceedings be taken against the South Suburban Gas Company for the recovery of the penalties incurred by them in relation to the gas supplied by them on Aug. 30, which was not of the illuminating power and purity prescribed by the Acts." The report and recommendation were adopted.

THE GAS QUESTION AT BISHOP'S STORTFORD.

Important Concessions to the Consumers.

The Directors of the Bishop's Stortford Gas Company announce their intention of reducing the price of gas to ordinary consumers, as from the 1st of January next, by 1d. per 1000 cubic feet. This will bring down the price in the town district to 3s. 9d., or 3d. below the standard, and in the Stansted district to 4s. 9d. There is also to be an alteration in the scale of discounts. Subject to the consumer entering into a special contract with the Company, the following allowances will be made: In the case of gas used for engines, and registered by a separate meter, a discount of 20 per cent. will be allowed quarterly off the current price charged from time to time throughout the district to ordinary consumers. Where gas is employed for lighting factories, institutions, &c., the scale of discounts will be as follows: Annual consumption exceeding 100,000 cubic feet, 5 per cent.; 250,000 cubic feet, 7½ per cent.; 500,000 cubic feet, 10 per cent.; 750,000 cubic feet, 12½ per cent.; 1,000,000 cubic feet, 15 per cent.; and 2,000,000 cubic feet, 20 per cent. These discounts will be allowed off the account for the last quarter of each twelve months. A quarterly charge will be made for the hire of all ordinary meters, ranging from 1s. up to 10s., according to size. The existing rates of discount, as well as all other terms of supply, inconsistent with the foregoing regulations, will cease at the close of the current year.

Company v. Municipal Management.

The following letter on the subject of the proposed purchase of the gas-works by the District Council, addressed to the Editor of the "Herts and Essex Observer" by the Secretary of the Industrial Freedom League (Mr. P. S. Bridgeford), appeared in that paper on Saturday:—

Sir,—The opinion expressed by Sir George Livesey against the purchase by the Urban District Council of the undertaking of the Gas Company has produced the usual cloud of statistics in favour of municipal ownership; and Manchester with a production of 4,838,636,000 cubic feet, Salford with a production of 1,553,231,000 cubic feet, Leeds with a production of 3,206,393,000 cubic feet, and Nottingham with a production of 2,017,394,000 cubic feet are held up as examples for Bishop's Stortford to follow with its present production of 34,070,000 cubic feet of gas. But the vice of the hysterical advocates of municipal trading is that they have no sense of proportion, and are ever advising the toad to emulate the ox, with the usual disastrous results. Then an endeavour is made to prove that municipal management is more efficient than company management by bulking the capital invested in each case, and giving the return on the investment as 6½ and 5½ per cent. But it is not stated that the majority of the largest undertakings are worked by local authorities, and that the smaller ones are in the hands of companies. In fact, the policy of local authorities has been not to purchase such undertakings except when they showed a substantial profit. It is said that municipal gas is cheaper than company gas; but no municipality last year was able to approach the charges made by the Sheffield Company—viz., from 1s. 6d. to 1s. 10d. per 1000 cubic feet. Numerous local authorities make a charge in excess of that made by the gas company; and a long list of them could be compiled showing

rates varying from 4s. to 5s. per 1000 cubic feet. There are, moreover, many local authorities charging 3s. 9d. per 1000 cubic feet in towns far more favourably situated for obtaining coal than Bishop's Stortford. From the official returns, it appears that in the following towns, whose position is more analogous to that of Bishop's Stortford than the towns mentioned above, losses were made by the Local Authorities carrying on the gas undertakings: Workington, Neath, Glastonbury, Beverley, Ossett, Shipley, Lockerbie, Peebles, Perth, and Newry. In several instances no profits are shown by local authorities; and in many cases the margin of profit is exceedingly small.

THE BRIGHTON GAS POISONING CASE.

Inquests were held on Monday last week at Brighton on the bodies of an aged couple named Hill, who, as reported in the "JOURNAL" for the 20th inst. (p. 831), were found in a bedroom, which was full of gas, at a boarding-house in Black Lion Street. When the discovery was made, the man was already dead; while the woman subsequently succumbed. It transpired that the man (who was 75 years of age) was a retired tradesman, of Derby, who had gone to Brighton on the day previous to the sad occurrence, with his wife, for a holiday. They engaged a bedroom for the night, and asked not to be called early, as they would probably sleep late. Accordingly, the landlord was not surprised at their non-appearance at breakfast time. As the morning wore on, however, and nothing was heard of them, he at last went up and knocked. Obtaining no answer, he called in the police; and together they broke open the door. Entering the room, they saw the man lying on the floor between the bed and the door apparently dead; while the woman was lying on the bed, breathing feebly. The room was full of gas; and there was just a glimmer of light burning at the jet. The tap used for connecting an india-rubber pipe to the gas-stove was turned on; and this tap was immediately underneath the burner of the gas-bracket. The post-mortem examinations showed that death in both cases was due to asphyxia; though there was evidence that the woman had suffered from old lung trouble, while the organs of the man were in a degenerated condition. A relative informed the Coroner that Hill had not had any trouble, nor had he been depressed.

Mr. A. S. Cook, the Chief Inspector of the Brighton and Hove Gas Company, explained that the tap under the gas-bracket for fixing an india-rubber tube did not turn easily. He imagined that, by accident, the lower tap was turned on; and when the mistake was found out, it was turned off, but not effectively. Mr. Joseph Cash, the Engineer to the Company, said the gas contained 14 per cent. of carbon monoxide. He expressed his regret at the unfortunate occurrence, and said the Company most deeply sympathized with the relatives of the deceased. The accident, he added, was in no way whatever due to the Company. It would, in his opinion, have occurred with ordinary coal gas just as with the mixture of water gas and coal gas used in this case. He could not understand why, as there was a light burning, there was not an explosion. In answer to the Coroner, witness said the Company did not consider it necessary to issue notices to consumers warning them of the mixture, as it was in use in practically all the towns of England. It was started in Brighton about ten years ago.

The Medical Officer of Health (Dr. Newsholme) stated that on various occasions he had reported to the Brighton Town Council on the question of the admixture of water gas with coal gas, and had given evidence on the subject before the Departmental Committee, who unanimously recommended that during the night service gas companies should not be allowed to supply gas containing more than 12 per cent. of carbon monoxide, or such greater amount as the Central Department might consider desirable. On this occasion, the amount was 14 per cent. The Committee had unanimously said that the danger of poisoning by this mixture was increasing; and, naturally, 14 per cent. of carbon monoxide was much more dangerous than 7 per cent. In his opinion, both Mr. and Mrs. Hill would have had a reasonable chance of surviving had the gas which escaped contained only 7 per cent. He was strongly of opinion that the public of Brighton did not know they were being supplied with a mixture of coal and water gas, and that they ought to be warned of the additional danger connected with defective gas-fittings as a result. It was important also that when gas-stoves were in small rooms there should be an efficient outlet for the foul air. Mr. Cash undertook to bring the matter before the Company; but he pointed out that they used the utmost precaution to ensure proper fittings, and issued warnings if they discovered any defects. He presumed that Dr. Newsholme would admit that, during all the years the Company had been supplying an area with a population exceeding 150,000 people, there had been only five mishaps attributable to the mixture. Dr. Newsholme said it was a small percentage of fatal cases; but it did not record also the non-fatal ones, which it was impossible to give in figures. Mr. Cash said the Company did not use the mixture until after considerable experience with it.

In each instance, the Jury returned an open verdict; stating that deceased died from suffocation caused by an escape of gas, but that there was not sufficient evidence to show how the tap became turned on. They, however, expressed an opinion that the tap in question should be removed to a safer place; and it was promised that this should be done.

Electricity v. Gas at Wakefield.—The minutes of the Street Lighting Committee which were submitted at the last meeting of the Wakefield City Council, set forth the acceptance by the Committee of an offer from the Gas Company to proceed with the remaining instalment of converting the public gas-lamps to the incandescent principle immediately after the completion of the second instalment, which was nearly finished, and then send in their account for the work as if it had been done next spring. Mr. Cookson reminded the Committee that the Corporation Electric Lighting Committee, where they had their cables, were willing to supply light at the same cost as gas; and seeing that the electric light undertaking belonged to the Corporation, he maintained that they were entitled to the preference. The minutes were passed.

GAS AND ELECTRICITY AT RYDE.

The General Purposes Committee of the Ryde Town Council, while considering tenders for lighting the town hall and buildings with electricity, received a letter from the Gas Company pointing out that modern incandescent gas-burners would prove more economical and efficient, and asking permission to fix five Lucas lamps, in order to demonstrate how large a saving of gas might be effected, in conjunction with considerable improvement in the light given. Attention was called to the fact that the lamps (which would be fixed and removed entirely at the expense of the Company) would, like the existing burners, help to ventilate the hall, but that the amount of heat thrown downwards by them would be insignificant. The Committee thereupon decided to accept this offer and postpone for the present further consideration of the electric lighting tenders; and they reported to the Council accordingly.

When the matter came up last week, Mr. Sweetman moved that the report be referred back to the Committee, on the ground that gas lighting for public buildings was unhealthy and out of date. He was exceedingly sorry that the Committee had practically shelved the electric light, and asked whether any sane man would say that the existing burners had helped to ventilate the hall. Mr. Barton thought the Gas Company might have put up the Lucas lights before, instead of waiting until the Electric Light Company was there; and he added that the incandescent light was all very well when one had a new mantle. Mr. Randall said the Committee wanted to find out the best and cheapest means of lighting the town hall; and he pointed out that with the new system the amount of gas consumed was much less, and the vitiation of the atmosphere was greatly reduced. With the electric light they would get stagnation, so that the exhalations of the people would not be carried away. Alderman James said he thought the Council ought to set an example by adopting electricity, which those who had the management of the churches and chapels should follow; while Mr. Weeks remarked that the offer of the Gas Company would cost the town absolutely nothing, and they would secure a better light. Another member (Mr. Holmes) spoke very favourably of the Lucas light, and said his friends who had tried it thought the electric light was much more expensive and not nearly so satisfactory as incandescent gas.

The proposition to refer the matter back was rejected by eight votes to five.

GAS v. ELECTRICITY FOR ORMSKIRK WORKHOUSE.

Electricity Favoured by the Guardians.

At the Meeting of the Ormskirk Guardians on Thursday—Mr. S. BRIGHOUSE presiding—the question of the supply of gas or electricity to the workhouse again came forward on a minute of the Building and Electricity Committee containing a resolution that it was desirable that the Guardians should themselves undertake the electric lighting and the provision of motive power, and that a scheme submitted to them should be proceeded with.

Mr. G. F. TRAVIS moved the adoption of the minute, and said the Committee had fully discussed the offer of the District Council to supply current at 4d. per unit for lighting purposes and 1¾d. per unit for power. The cost under the estimate of the Engineer (Mr. Peers) would be £315 a year, and the lighting alone was £273. Taking it from the Electric Supply Company at the prices quoted, it would be £402 for the same amount Mr. Peers had named. For lighting only, it would be £250 (for the current only); and they would have to add the interest and sinking fund. The gas bill last year was £225, and the number of burners about 200. Under Mr. Peers' scheme, the number of lights was 700, including the new imbecile block, workrooms, generating station, and Board and Committee rooms and offices.

Mr. COULTON moved an amendment that the Board accept the offer of the District Council to supply electricity at 4d. per unit for lighting and 1¾d. per unit for power. He suggested that if they purchased their current from the Council they could obtain a certain quantity of gas and be able to form an idea which was the best and cheapest illuminant. He thought it was outside the province of the Guardians to go in for generating electricity, especially when they had an offer from the Local Authority to supply it.

Mrs. HOLLAND seconded the amendment.

The CLERK read a letter from the Ormskirk Gas Company, stating that on the Guardians accepting their offer to put in a free installation of incandescent gas lighting, the necessary burners and fittings were ordered. They had arrived, and the Manager had commenced fixing the same in the dining-hall of the workhouse.

The CHAIRMAN said they were all permeated with the one idea of lighting the workhouse in the best possible manner and at the cheapest rate. He suggested that Mr. Travis's figures should be put into print, so that they could analyze and criticize them. Then the Gas Company, having had the opportunity of putting in a free installation of modern gas lighting in the dining-hall, should be permitted to carry it out; otherwise the Guardians would be dealing unfairly with them.

Mr. TRAVIS, in reply, said they could not get behind the fact that for 200 gas-burners they were paying £225 for the past year. They ought to settle the matter at once.

On the amendment being read out,

Mrs. HOLLAND said it was not quite in accordance with her views, as she did not advocate the introduction of electricity. She therefore declined to second Mr. Coulton's proposal.

There being no other seconder, the amendment was disposed of.

The CHAIRMAN moved, as a further amendment, that the question of electricity be adjourned for a month, and that in the meantime copies of Mr. Travis's speech should be supplied to the Guardians, and the Gas Company be asked to quote special rates for the supply of gas to the workhouse buildings.

Mr. HAYWOOD seconded the proposition.

On a vote being taken, the amendment was lost by 18 votes to 20; and the minutes of the Committee were confirmed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas Committee of Glasgow have under consideration a motion by Mr. Hugh J. Miller, in which they are asked to recommend to the Corporation that the minimum standard of illuminating power of the gas supplied from each of the gas-works belonging to the Corporation be reduced to 18 candles. The Corporation supply gas of over 20 candles. They have power to reduce the illuminating power to 16 candles; so that the proposal, if adopted, will not involve any question in Parliament.

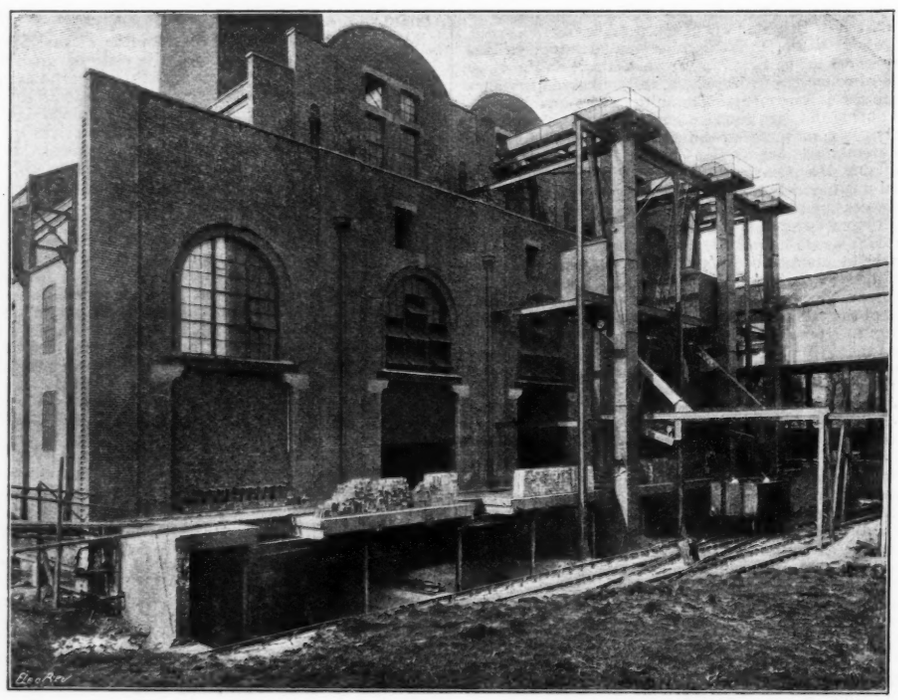
Among the business relating to the Corporation Gas Department which was transacted by the Town Council last week, was an item in reference to the employment of men in the gas-works. The Gas Committee's minutes stated that they had taken into consideration the remit made to them by the Corporation on the 16th of June last: (1) Upon the subject-matter of a motion by Councillor Burgess, to the effect "That the Station Managers, in engaging extra men for the winter months, be instructed to confine such engagements to applicants who can show a record of twelve months' continuous residence in Glasgow at the time the engagement is made, and that, of such applicants, preference be given, as far as practicable, to ratepayers;" and (2) a letter, dated Aug. 24, addressed by Councillor Burgess to the Town Clerk relative thereto. After full deliberation and discussion, the Committee agreed to recommend: (1) That in future printed schedules be issued by the Station Managers at each of the gas-works to all applicants for work at those stations; (2) that each of the schedules, when filled up and returned to the Station Managers, should contain the name and address of the applicant, the place where last employed, and other particulars required thereby; (3) that the schedule so sent in be retained as a record of the applications made for employment at those stations, and that from those schedules suitable workmen be selected by the Station Managers at each of the works; and (4) that in making such selection, preference be given, as far as practicable, to those applicants who are ratepayers within the city. The Town Council, without remark, adopted these recommendations.

The aftermath of the great events in Glasgow last week comes in now. One of these ludicrous incidents is to be found in the statement made in a couple of newspapers, the Editors of which would consider themselves greatly insulted were they to be referred to as other than leaders of thought, to the effect that the Provan Gas-Works "are among the largest and most modern in the country. They will be capable, when completed, of producing 48,000 cubic feet of gas per day." It is scarcely necessary to say that the figure should have been 48,000,000 cubic feet; but the statement shows the amount of ignorance upon general every-day subjects which prevails even among pressmen.

The Monifieth Gas-Works, which are only a few years old, were intended when they were erected to be a municipal undertaking; but on account of fierce opposition, the reason for which no one outside the burgh could understand, this intention was defeated, and the works were opened, and have been carried on, as the property of a private Company. The proposal to municipalize them has again come up. Last week a special meeting of the Town Council was held to consider the propriety of adopting the Gas Acts, with a view to purchasing the gas undertaking. It was stated that the works were now a paying concern, and that if they were financed by the Town Council, the price of gas might be reduced. Provost Stewart called upon those members of the Council who were not shareholders of the Gas Company to express their opinions. It was moved and seconded that the Acts be adopted. Two other members of the Council supported the proposal; and Provost Stewart declared the motion to be unanimously adopted. He had no doubt that it would be for the benefit of the community if they were in possession of such an absolute necessity as the gas-works. The subject has, of course, to run the gauntlet of the municipal election, when it will be interesting to observe whether the former acrimony has, or has not, died out.

There was a most unfortunate breakdown of electric lighting in Edinburgh on Thursday evening. The Institute of International Law, which is a body composed of the most erudite of all civilized nations who interest themselves in the formulating of regulations for the guidance of Governments in times of crisis, are holding one of their stated conferences in the city. On account of the eminence of the body, the use of the ancient Parliament Hall was granted to the legal societies for their entertainment. In the midst of the dinner, the electric lights went out, leaving the hall, as is reported, "in a dim obscurity, lighted only by the candelabra, with their coloured shades, which was not at all unpleasing." This happened shortly after eight o'clock, when an increased pressure on the fittings caused a fuse to give way. Of course, it was known what had happened; but there being many fuses in the place, some of them in parts of the building very much out of the way, the difficulty was to locate the fault. It accordingly took some time to remedy it.

The Corporation of Forfar have got into a difference with the Auditor of their accounts—Mr. A. Mackay, of Dundee. He has reported to them that, with reference to the loans under the Forfar Gas Act of 1871 and the Forfar Gas Amendment Confirmation Act of 1880, no provision has yet been made towards making up the shortage of £840, with interest, in the sinking fund. There were sums of £1277 and £1180, part of the funds standing at the credit of the sinking fund and reserve or contingency fund respectively at May 16 last, for which no separate investment had been made in accordance with the provisions of the Acts mentioned. He also points out that, with reference to loans for other purposes, in connection with one of them the amount allowed for sinking fund has been at the rate of 2 instead of 5 per cent., and that in another case no provision has been made for repayment of the loan. The Town Council discussed the Auditor's report on Wednesday, and remitted the matter to a Committee for report.



THREE CONVEYORS ON A LARGE COAL STORAGE PLANT

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NEW CONVEYOR CO., LTD., SMETHWICK.

The new gas-works which have been in course of erection at North Berwick during the past twelve months are to be opened on Thursday, Oct. 13. The ceremony is to be performed by Mr. R. B. Haldane, K.C., M.P. for the county of Haddington, within which the works are situated. The works have been erected to plans prepared by Mr. J. M'Gilchrist, of Dumbarton, whose son, Mr. John M'Gilchrist, has been Assistant-Engineer throughout the construction.

On Thursday evening, the members of the Dundee Institute of Engineers, to the number of thirty, visited the Corporation Gas and Electricity Works at Broughty Ferry. Both works were described to them by the respective Managers. It was explained that alterations and improvements are at present being made upon the gas-works; and it was pointed out how, when completed, coal and coke will be carried by the railway, and the methods of breaking the coal and quenching the coke were described. On the motion of the Secretary of the Institute, the Corporation were thanked for having afforded the opportunity of visiting the works, and Mr. Crystal, the Convener of the Gas Committee, said the Corporation were pleased to see the visitors.

A little incident with a prepayment gas-meter occurred in a house in Canal Crescent, Perth, on Sunday evening. The meter was situated in the bottom of a wooden press; it being quite common to place meters in most awkward corners. The occupant of the house went with a light to ascertain where to insert a coin; but instead of being able to effect this, the light set fire to the gas which had been leaking. The man was unable to extinguish the flames, and ran for a policeman, who, with more knowledge of how to proceed in such cases, cut off the gas supply, and the fire was then easily subdued. Prepayment meters are much more frequently visited than ordinary meters; and it follows that they should be placed in more accessible positions than have hitherto been considered suitable for gas-meters.

On Thursday, the Edinburgh and District Water Trust met for the purpose of levying the assessments for the current year. Mr. Wood, the Convener of the Finance Committee, said there must, as anticipated, be an addition to the water-rates for the current year. The Trustees and the general public were fully aware of the large expenditure of the past ten years in connection with the new scheme for providing an additional supply of water from the Talla. In the year ending Whitsunday, 1895, the mortgage debt of the Trust stood at £707,947, and the interest paid upon it amounted to £21,402. At Whitsunday, 1904, the mortgage debt and temporary loans amounted to £1,728,983, and the interest paid to £47,738; while the estimate for the current year now before the Trustees provided for £52,035 as interest to be paid—an increase of £30,633 between those years. Up to the present, there had been no increase in the rates for water supply, as all deficiencies had been met from an accumulated surplus balance on hand, but which was now practically exhausted. The actual expenditure last year amounted to £126,529, and the revenue to £113,268; showing a deficit of £13,261, which was met from the surplus balance on hand. The estimated expenditure of the current year was £133,493; being an increase over last year of £6964, which would leave a deficiency for this year of upwards of £20,000. There was still £3204 of the surplus balance left; but the remainder would have to be met by additional assessment. The Finance Committee recommended that there should be an increase on the domestic rate of 1½d. in the pound, making it 6½d., which, it was estimated, would yield £11,025, and an addition of ½d. in the pound to the public water-rate, making it 1½d., which, it was estimated, would yield £6831—together, £17,856; leaving a small deficiency to be met out of the surplus balance still on hand. The recommendations of the Committee were adopted unanimously.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 24.

Sulphate of Ammonia.

Demand for prompt delivery has been well sustained; and available supplies being only moderate, prices have hardened somewhat on the week. The closing quotations are £11 15s. per ton f.o.b. Hull, and £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Leith and Liverpool. Similar prices would be paid for October. There has been considerable inquiry for October-December; but for this position makers require a premium of 5s. per ton, and as yet buyers have not followed. It is reported that £12 5s. per ton has been paid for April-September delivery f.o.b. Leith; this price having been repeatedly bid and refused for January-June, for which position £12 10s. is now quoted, as also for January-March and for January-April.

Nitrate of Soda.

This article is firm in all positions; and spot prices are 10s. and 10s. 4½d. per cwt. for ordinary and refined qualities respectively. For spring delivery, ordinary quality has been advanced from 10s. to 10s. 1½d. per cwt.

LONDON, *Sept.* 23.

Tar Products.

Markets have been generally quiet; but there has certainly been rather more demand, especially for forward delivery. In pitch, London makers appear rather firmer in their ideas, and as a rule ask 27s. 6d. per ton. Consumers, however, do not seem at all inclined to purchase at present, and decline to pay any advance in value. Sales are still being made on the Continent at very low prices; while in South Wales consumers are inquiring for delivery all over next year, but do not appear to take much interest in early deliveries. Yorkshire pitch continues in fairly good demand, as is the case with Midland makes; but as the time is now approaching when the output will increase very considerably, it remains to be seen whether present prices will be maintained. Dealers certainly appear to believe in still lower quotations, as offers are being made, both on the Continent and in South Wales, at prices proportionately lower than those at present ruling. There is

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certainly more inquiry for benzol. Some business is reported in 90 per cent. at 9¼d. per gallon for prompt delivery; while distillers have declined the same price for October-December shipment. In 50-90 per cent., some quantity was sold for delivery in the North at a price equal to about 7¼d. f.o.b.; but business has undoubtedly been done at less than this in the Lancashire district. The position of anthracene remains unchanged. One or two small parcels have been sold for prompt at prices varying from 1⅞d. to 1¾d., according to quality and percentage; but so far as forward delivery is concerned, makers are not at all inclined to sell. In solvent naphtha, there is still a fairly good demand for home consumption; and during the past week there have been one or two inquiries for export. Prices, however, rule low; and there does not appear to be much chance of improvement just at present. Carbolic acid is undoubtedly better, and consumers are showing more desire to purchase for November-December than was the case a week or two ago. It is reported that offers of 1s. 9½d. have been declined in several instances; but consumers still as a rule only offer 1s. 9d. to 1s. 9¼d. The present very low prices which are ruling for crystals must act injuriously to the value of crude; but it is expected that an improvement will take place in the former article, as there are now several inquiries in the market for forward delivery, although prices offered by consumers are still very low. The market for creosote is not quite so firm. In the North, there is certainly more offering; one or two of the largest makers being evidently anxious to sell for both prompt and forward delivery, doubtless with a view to placing their make for the winter months. In London also there appears to be rather more offering; while there is not quite so strong a demand as was the case a week or two ago.

The average values during the week were: Tar, 17s. to 20s. 6d.; pitch, London, 27s. to 27s. 6d.; east coast, 27s.; west coast, 25s. 6d. to 26s. Benzol, 90 per cent., 9d. to 9¼d.; 50-90 per cent., 7d. to 7¼d. Toluol, 6½d. to 6¾d. Crude naphtha, 2⅜d. to 2⅝d.; solvent naphtha, 8d. to 8½d.; heavy naphtha, 10d. to 10¼d. Creosote, London, 1⅝d. to 1 11/16d.; North, 1⅝d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 9¼d. to 1s. 9½d. Refined naphthalene, £4 10s. to £8; salts, 20s. 6d. to 22s. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market is steady; and there is a very strong demand for forward delivery. There are several inquiries in the market; but makers as a rule decline to sell. Beckton quote £12 for early delivery, but decline to quote forward. South Metropolitan maintain their price for early delivery, but are quite indifferent as to forward business. In Leith, business is reported at £11 17s. 6d. for prompt. For November-December £12 has been paid; but there is a report on the market that over £12 5s. has already been realized for January-June. Business has been done in Hull at £11 16s. 3d. for October shipment; but £12 2s. 6d. has been paid for November-March next year, while £12 5s. is asked for January-June. The market closed with a very firm tone, especially as regards forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has been a steady increase in sales in almost every department, largely due to the revived cotton trade. Engine coal, forge coal, coke, and coal for domestic purposes have found a better market; but the supplies are abundant, and there has been no real increase in prices. Forge coal, however, is firmer; and contracts for as much as 10,000 tons in a single order have been made at over 8s. per ton. Increased deliveries at the gas-works are being pressed. The trouble with the surfacemen at the Yorkshire collieries is not yet satisfactorily settled. A ballot is being taken, returnable on the 3rd prox., as to whether the 5 per cent. reduction in wages is to be refunded; and, if not, what other steps are to be taken. The Scottish Coal Trade Conciliation Board meet on the same day to take into consideration the position of affairs regarding the wages agreement. Trouble is brewing over a dispute in the Trencherbone mine at Tyldesley, having reference to "holing in" thick hard "dirt," which the men say they ought to be paid for. A ballot has been taken; and the majority of the miners are in favour of a strike if some reasonable allowance is not granted. Quotations are: Best house coal 13s. to 14s. per ton at the pit, secondary qualities 11s. to 12s., common 9s. to 10s., steam and forge coal 7s. 6d. to 7s. 9d. for common, and from 8s. 3d. to 8s. 6d. for better qualities. Best slack is firm at 6s. to 6s. 6d., secondary at 5s. to 5s. 6d., and common at 4s. to 4s. 6d.

Northern Coal Trade.

There has been a change in the condition of the coal trade of the North; the demand for steam fuel being less, and that for Durham coals firmer. Best Northumbrian steam coals are weak at 9s. 3d. per ton f.o.b., second-class steams are about 8s. 3d., and steam smalls are rather scarce at 4s. to 4s. 3d. The steam coal collieries have their present production fairly well taken up; but forward orders are fewer. In the Durham coal trade there is a rather better inquiry for household coals; but supplies are still plentiful, and prices dull. In the gas coal trade, the demand now grows more rapidly; and large users are taking heavier deliveries. The prices quoted may be said to vary with the quality from about 7s. 10½d. to 8s. 6d. per ton f.o.b. Contracts are not numerous at present; but the tendency of the market is rather towards a steadier tone, as those that are current take up a large portion of the production of the best gas coals. Where there are shipping contracts for gas coke, the price is fairly steady at about 13s. per ton f.o.b.; but at some of the inland centres of production, prices are weaker.

Scotch Coal Trade.

Trade continues steady; and though the wages question is not yet settled with the miners, the outlook is more hopeful. The men at present are working with greater regularity; and the output is being got away. Prices have not improved; but there is a suggestion that,

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BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	530,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2ad Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2ad Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

at all events in regard to splint, an advance may soon be expected. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s., and splint 8s. 6d. to 8s. 9d. The shipments for the week amounted to 268,196 tons—an increase of 11,123 tons over the preceding week, and of 3100 tons over the corresponding week of last year. For the year to date, the total shipments have been 8,187,098 tons—an increase of 247,454 tons over the corresponding period.

Gas Companies' Dividends and Income-Tax.—The Kingston Gas Company have intimated to their shareholders that in consequence of the recent decision in the Court of Appeal in the case of *Attorney-General v. Ashton Gas Company*, it will be necessary for the income-tax to be deducted from future dividends, instead of the tax being paid by the Company as heretofore.

Gruesome Discovery at Bristol.—During the excavations for the new offices of the Bristol Gas Company, the workmen unearthed three skeletons, all in a fairly good state of preservation; and later on seventeen others have been brought to light. How many years the bodies had lain in the ground is a matter of conjecture. It is said that a monastery originally stood upon the spot.

Gas Explosions at Derby.—An escape of gas from a main led to a series of explosions in the streets of Derby last Saturday morning. For some time previously an odour of gas had been detected at the corner of Macklin Street and Becket Well Lane, and on the morning in question a gang of men set to work to locate the leakage. After they had been digging some time, the smell of gas became stronger, and on getting near the main one of the men struck a stone with his pick, causing a spark, which at once ignited the gas. A manhole lid, paving-stones, and a cloud of rubbish were thrown into the air. A second explosion occurred in another manhole about 150 yards distant. Fortunately, however, no one was injured in either case.

Unprofitable Electric Lighting at Dartford.—The accounts of the Dartford electric light undertaking for the year ending March last show a deficiency of £2316; but taking into consideration outstanding credit amounts, the actual loss was £1619. The net expenditure was about balanced by the net income in the ordinary revenue account; and the deficiency represents the sums paid for interest and sinking fund, which had in March reached a total of £34,500. Gas competition has, it is said, been keen; and up to the last few months the inhabitants have been slow in adopting the electric light. Only £1418 was received from private consumers; while the contribution for public lighting figured as £934. Out of 264,000 units generated, 192,000 units were sold, 17,000 units were used at the works; and 54,000 units were unaccounted for. It was the position of the electric light undertaking that induced the Council to enter into an arrangement recently with a Company for a "construction lease" of the tramways, to avoid the possibility of any acute burden on the rates for the next few years.

New Retorts at Southport.—At the Crowlands Gas-Works of the Southport Corporation, a commencement has been made with the introduction of clay retorts, specially constructed under a new system by the Gas Engineer (Mr. J. Bond), and greatly improved results are expected from their use.

A German Gas-Engine Combination.—According to the "Ironmonger," a scheme is being promoted by the leading works with a view of arriving at an understanding in relation to the prices of large gas-engines. Among those associated with the proposal are Körting Bros., the United Augsburg and Nuremberg Machine Company, and the Deutz Gas-Engine Works.

Incandescent Gas Lighting in Bermondsey.—The General Purposes Committee of the Bermondsey Borough Council reported at last Tuesday's meeting that they had had under consideration the extension of incandescent gas lighting in certain streets in which no electric mains are laid. They recommended that 300 No. 3 Kern burners be purchased and fixed in the lamps, at an estimated cost of £225. This was agreed to.

Additional Capital for the Maidstone Gas Company.—Under the Act which the Maidstone Gas Company obtained last year, they were authorized to raise additional capital which they were allowed to offer to the consumers, the employees, and the stockholders. Acting upon this authority, the Directors a few weeks ago invited applications for £2200 of 5 per cent. stock, in amounts of not less than £10, or any multiple of £5, at the price of £140 per £100 of stock, at which figure the yield to the investor would be £5 8s. 11d. per cent. The amount offered was applied for five times over; and half of it was allotted to the employees and the balance to the consumers. The Directors are highly gratified at the result of the first exercise of their new powers in regard to the raising of capital.

The Walshaw Dean Water-Works of the Halifax Corporation.—A visit was last week paid by the members of the Halifax Town Council and the officials to the reservoir works at Walshaw Dean, for the purpose of opening the waterman's cottage and the Corporation committee-room. Mr. James Parker, the Chairman of the Water-Works Committee, who declared the buildings open, was presented with a handsome key by Mr. G. H. Hill, the senior partner in the firm of Messrs. Hill and Sons, the Engineers. The total cost of the three reservoirs, (which, after providing for compensation water, will increase the Halifax supply by some 2½ million gallons a day) is estimated at about £250,000; and it is expected that more than two years will still be needed to complete the work. Speaking at the subsequent dinner, Mr. Parker remarked that, great as was the estimated cost of the Walshaw Dean scheme, it was fully 20 per cent. below that incurred by neighbouring towns in providing themselves with reservoirs of a similar capacity. This, he thought, ought to be satisfactory both to the Corporation and to the ratepayers. Nothing had been spared to ensure that the reservoirs, when completed, would be efficient and lasting.

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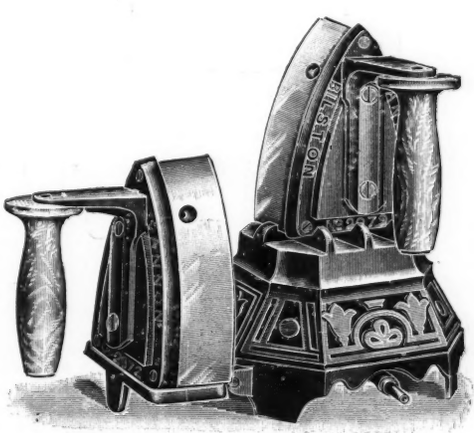

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Sale of Gas Shares.—At a local sale by auction last week, ten original £10 shares in the Slough Gas Company were sold at prices ranging from £23 15s. to £24 5s. each.

Antwerp Water-Works Company, Limited.—The report of this Company for the half year ended the 30th of June shows a net profit of £21,091, compared with £19,586; and the Directors declare an interim dividend at the rate of 7 per cent. per annum. The new works have been pushed on with rapidity, and excellent progress has been made.

New Water-Works for Warsop.—New water-works which have been constructed for the supply of the parish of Warsop have just been opened. The scheme has been carried out at a cost of about £10,000. This includes everything except the boring trials, which involved an outlay of £500. There was a large attendance at the function, over which Mr. S. F. Wilson, as Chairman of the Urban District Council, presided. Lady FitzHerbert accepted the invitation to perform the ceremony, which she did by means of a silver-gilt key presented to her for the purpose by Mr. R. F. Vallance, of Messrs. Vallance and Westwick, the Engineers to the scheme.

Gas Charges at Dukinfield.—A Mr. Hadfield has been calling the attention of the Town Clerk of Dukinfield to the prices charged for gas, and pointing out that the large consumers are having 4d. per 1000 cubic feet too much reduction, inasmuch as the rates to such consumers are from 5d. to 9d. per 1000 cubic feet lower than "the largest price charged to the small consumers"—viz., 3s. 6d. per 1000 cubic feet—whereas according to the Act they ought to be charged from 1d. to 5d. per 1000 cubic feet less. In reply to this, the Gas Committee instructed the Clerk to acquaint Mr. Hadfield with the fact that the charge of 3s. 1d. per 1000 cubic feet to holders of slot meters (which apparently was what he referred to in his letter as being "the largest price charged to the small consumers") included a charge of 4d. per 1000 feet for hire of the meter. Mr. Hadfield is so far from being satisfied with this view of the matter that he is promoting a requisition to the Mayor for a town's meeting to be called to discuss the subject.

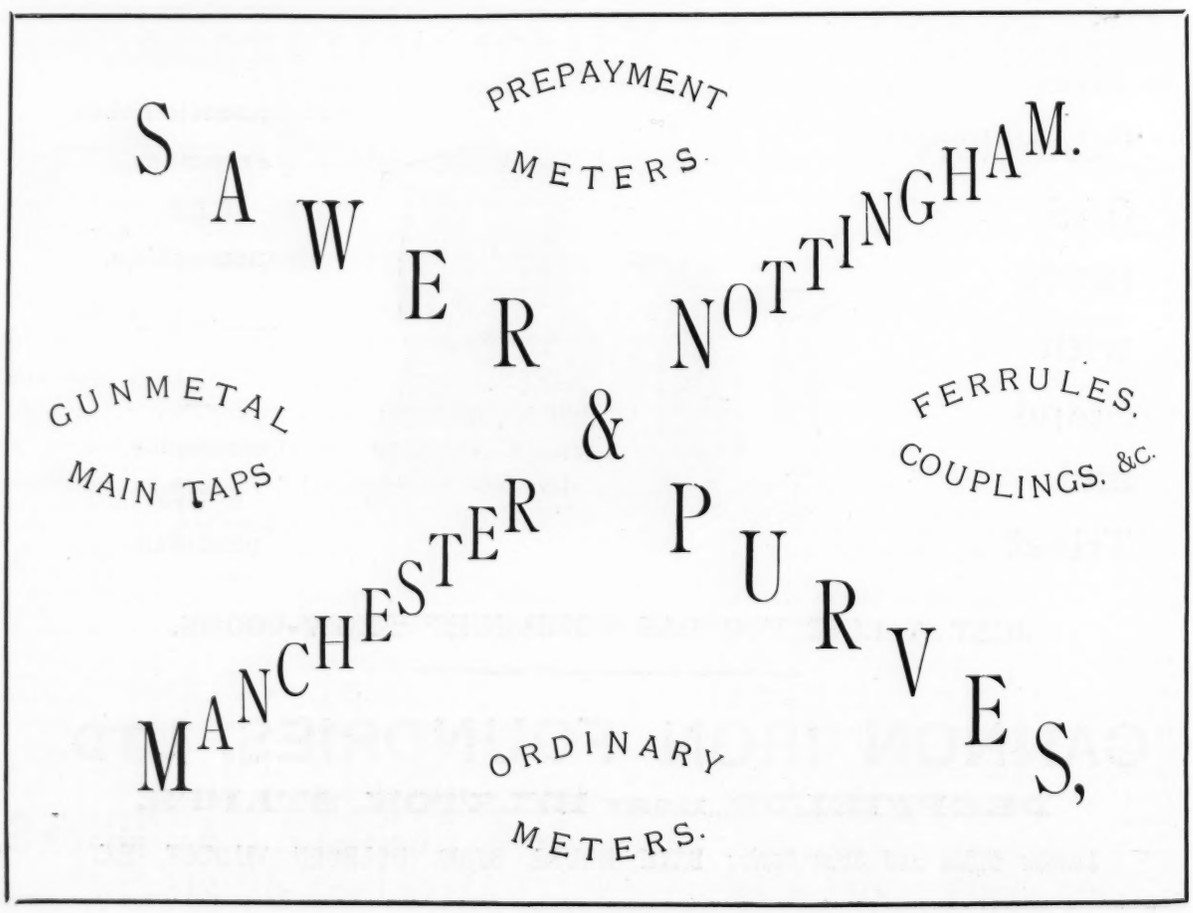
Truro Water Supply.—Among the applicants to Parliament next session will be the Truro Water Company. In consequence of the increased demand for water, new works have had to be constructed, including a reservoir, filter-beds, rising main, &c., and it is necessary to raise more money. It was explained at a recent meeting of the shareholders that the capital is exhausted, and the Directors suggested that the sum for which authority ought to be sought should be sufficient to cover any probable requirements for many years to come. Mr. A. C. P. Willyams, the Chairman, said that if this course were adopted the new capital could be called up as required. Mr. J. C. Daubuz, in moving that the Directors be authorized to promote a Bill to enable them to raise £20,000 additional capital, said the undertaking had been crippled for want of capital; but this had induced them to exercise great economy. They had done work to the amount of £5800 out of revenue, and had sufficient funds to pay for the new engine. The resolution was carried.

Reductions in Price.—The Warminster Gas Company are to reduce the price of gas to 3s. 6d. per 1000 cubic feet, as from the end of the current quarter—representing a concession of 2d. per 1000 feet. The Directors of the Dorchester Gas Company have decided to reduce the price of gas from the 1st prox. from 3s. 10d. to 3s. 8d. per 1000 cubic feet. This is the lowest figure at which gas has ever been supplied in the town.

Unreliability of the Electric Light.—A diverting incident was recalled last Friday by Sir James Kitson, M.P., in inaugurating a village institute near Leeds. He said that recently he was invited to open an extension of a Science Institute, and it was arranged that he should enter a room and turn a key, when there would be a blaze of electric light. Sir James had made some suitable remarks about the advance of science and the resources of civilization, and then opened a door. Instead of there being "a blaze of electric light," emblematic of progress and enlightenment, the room was in total darkness. After an awkward interval, the officials fell back on the despised, but more trusty, gaslight.

Fires Caused by Electricity.—Two fires which originated in connection with the supply of electricity occurred in London on Saturday. As the result of a defective electric circuit, three low-tension switchboards burst into flame at the storage works and offices of the Metropolitan Electric Supply Company, Limited, in Tower Street, W.C. The ground floor was immediately enveloped in smoke and fire, and a workman named Henry Scott was brought out in an insensible condition, and removed to the hospital. Considerable damage was done to the premises. Later in the day firemen were called to Nos. 16 to 18, Fitzroy Square, where a similar defect had caused the electric cables to fuse on the premises of the Home Hospitals Association. The damage done was, however, restricted to the basement.

Cheap Gas for Motive Power at Ossett.—The Gas Engineer and Manager of the Ossett Corporation (Mr. Arnold E. Mottram) has issued a circular which will be of considerable interest to the users of power in the district. It conveys the information that, as from next Saturday, the price of gas consumed for the production of motive power will be subject to a discount of 25 per cent. on quarterly accounts paid within one month of becoming due. The Gas Department are now prepared to supply and fix gas-engines upon advantageous terms for cash, or upon quarterly payments spread over five years. These are set forth in a table accompanying the circular. A consumer purchasing an engine on the five-years hire-purchase system may, at any time before the twenty quarterly instalments have been completed, pay the balance of the purchase-money owing, and 5 per cent. discount will be allowed off the balance paid in advance. Mr. Mottram expresses his willingness to advise any firm who require additional power, or are contemplating alterations, and to quote for special high-speed gas-engines suitable for electric lighting purposes. He points out that gas at the reduced price at which it is to be supplied will be equal to electricity at ½d. per unit.



Curtailment of the Manchester Water Supply.—The Water Committee of the Manchester Corporation have at length become alarmed at the unusual dry weather we have experienced during the present month; and on Sunday evening the supply was curtailed until further notice—being cut off at 7 p.m. until 6 a.m. The Committee state that only 33 days' supply is in the reservoirs, at the average daily consumption of 35 million gallons. By the partial stoppage, they hope to effect a saving of 7 million gallons per day. The watering of the streets is being discontinued.

Explosion at a Gas Manager's House.—Mr. T. R. Collins, the Manager of the Stony Stratford Gas-Works, had an uncomfortable experience on Wednesday night, when explosions of gas occurred at his house adjoining the works. Mr. Collins had only been in bed a short time, when a smell of burning caused him to hurry down, to find the office on fire. A slight explosion of gas then took place; and Mr. Collins's wife and family were got out of the house, and the gas turned off at the main. Very shortly afterwards, there was a second and more serious explosion, which wrecked the office and downstairs rooms, and did other damage. Fortunately, no one was seriously hurt; but much sympathy is felt with Mr. Collins, who has only just recovered from a serious illness. The cause of the fire is a mystery.

Oil Stove and Lamp Accidents.—The Chief Officer of the Public Control Department of the London County Council (Mr. Alfred Spencer) states in his annual report on the work of the department that during the year 1903-4 there were 56 petroleum stove accidents reported in the County of London. Three of these proved fatal, and involved a loss of three lives. Usually the accidents were caused by the stoves being overturned or on the wick being raised or lowered to too great a degree. The inspectors investigated the causes of 142 oil-lamp accidents, nine of which were fatal, involving the loss of nine lives. He says it is satisfactory to record that the number of accidents is smaller, and the number of lives lost less, than in any previous year since a systematic investigation of lamp accidents has taken place. From July, 1890, to March 31, 1904, there were 2784 accidents brought under the notice of the inspectors, and of these 320 were fatal, involving the loss of 358 lives.

Settlement of the Dispute at Messrs. Graham, Morton, and Co.'s Works.—It is not often that a dispute which involves some hundreds of skilled workmen and their employers is settled with such promptness, and so thoroughly, as that which about ten days ago induced the boiler-makers employed by the above-mentioned firm to leave their work in a body, as recorded in the "JOURNAL" last week. In this particular instance, the spirit of firmness on the part of the employers, in maintaining absolute freedom to engage in their works non-Unionists equally with Unionists, leavened with a spirit of conciliation, by which Mr. Maurice Graham was induced to accord an interview to the representatives of the Executive Council of the Boiler Makers' and Shipbuilders' Society, is, in a large measure, responsible for the happy results. The Union officials displayed wisdom in refusing to recognize the unauthorized action of the men in absenting themselves from their work; and, on the other hand, the firm evinced their sense of fairness by agreeing to take back as many men as they required. Some minor grievances as to checking and the question of overtime will now be settled by the firm having joined the Employers' Federation. They refuse to be coerced by the Union into employing only Union men, and maintain their position—*i.e.*, perfect freedom to employ whom they please, and have no interference in the management of their business.

The Parliamentary Powers of the Tees Valley Water Board.—The resolution authorizing the Tees Valley Water Board to promote a Bill for the purpose of extending to 1914 the time for the completion of the Grassholme and Long Newton reservoirs, to increase the borrowing powers, &c. (which, as recorded in the last issue of the "JOURNAL," has already been passed by the Thornaby Town Council), was last Tuesday submitted to the Middlesbrough Corporation. Alderman Baker said the cost of the latter reservoir would be £300,000, while the estimate was £80,000. The reservoir was built expressly for the benefit of the manufacturing firms of the district; and he therefore thought that those who, as large consumers, got their water at 3½d. per 1000 gallons, should be asked to contribute an additional ½d. for the water, in order to cover the cost of constructing the reservoir. Mr. Mattison, however, remarked that to go to the ironmasters and ask them (of their own free will) to pay more for their water, appeared to him to be mere waste of time. After a long discussion, the resolution was carried; and it was agreed to ask the Board to consider whether it would be possible to arrange for an additional charge to be made to the large consumers. On Wednesday, a similar resolution was agreed to by the Stockton Corporation; but here also some dissatisfaction was expressed with the low prices at which the manufacturers were supplied with water.

Lewes Gas Company.—The report which was submitted at the half-yearly meeting of the Lewes Gas Company last week stated that the revenue account showed a profit for the half year to June of £1529; and after providing for interest on mortgages, there was an available balance of £3094. Dividends were recommended for the six months at the rate of 5 per cent. upon the original capital stock and 3½ per cent. upon the additional capital stock. These would absorb £1412, and leave £1681 to be carried forward to the next accounts. The Directors pointed out that they had reduced the price of gas to the ordinary consumers by 2d. per 1000 cubic feet as from the beginning of the present quarter, and that they had also made a corresponding reduction to prepayment consumers in the rents of gas cookers, fires, fittings, &c. The Chairman (Mr. C. R. Kemp) remarked that the output of gas had increased by nearly a million cubic feet, and that residuals had yielded better prices. The reduction in the price of gas had been rendered possible by the fact that their coal contract came to an end at Midsummer, and they had been able to enter into a fresh one on advantageous terms. The report was adopted; and, in replying to a vote of thanks, the Chairman said that not only were the shareholders indebted to the whole Board, but also to the Secretary (Mr. H. J. Hillman), the Manager (Mr. Levi Monk), and all connected with the administration of the Company's business.

IMPORTANT

NOTICE AND CAUTION.

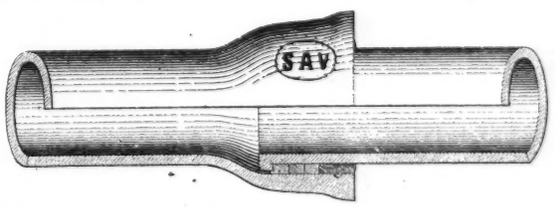
VERTICALLY CAST IRON PIPES.

It has been recently brought to our notice that a Firm has been offering Pipes as of **French Manufacture,** when the origin is of another Country, where the product is not as reliable as that of **Society D'Aubrives, Ardennes, France.**

The Directors are anxious to protect their **Clientele** from imitations which are offered under false representations, and to call the attention of Engineers to their **Brand**—

"S.A.V."

which is cast on the Sockets of all Pipes made **under their Patent Clarifying Process.**



The Society has a universal reputation for the excellence of their product, and by the kind assistance of Engineers, notifying to the Company, or their Agent direct, their intention to buy French Pipes, any attempt to substitute inferior material will be avoided.

Please address all communications to:

A. G. CLOAKE (British Agent),
54, HOLBORN VIADUCT, LONDON.
TELEGRAMS:—"Amour, London."
TELEPHONES: 1890 Holborn, and 194 Central.

WORKS ADDRESS:
THE SOCIETY D'AUBRIVES,
ARDENNES, FRANCE.

The Chester Gas Company have instructed Messrs. S. Cutler and Sons, the sole licensees and manufacturers, to extend the Jäger system of purification at the Chester Gas-Works. The firm have orders in hand for applying the system to over thirty purifiers in the country.

Messrs. Bryan Donkin and Clench, Limited, of the Lincoln Works, Chesterfield, and London, are sending out their new catalogue of valves. It will be found to be of a more comprehensive character than any previous issue, and to include all the latest types of valves produced by the firm, who for upwards of fifty years have made a speciality of internal rack-and-pinion gas-valves. The catalogue includes an illustrated summary of the various appliances for gas-works, such as exhausting plant, &c., of which the firm are makers.

The Powell Duffryn Steam Coal Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a steel tank and a three-lift gasholder to contain 300,000 cubic feet of gas. This holder has to be used in connection with a large installation of coke-ovens which are being installed by the Company at their new colliery at Bargoed.

The Gas Committee of the Glasgow Corporation have placed with the Barrowfield Iron-Works, Limited, a contract for putting down an installation of cyanide plant at the Provan Gas-Works, at the price of £544. The Corporation have let a contract for the supply of 800 tons of cast-iron pipes, for the Water Department, to Messrs. Robert MacLaren and Co., of Glasgow, at the price of £4001.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS TESTER. No. 4270.
FOREMAN COKE-OVEN WORKS. Priestman Collieries, Newcastle-on-Tyne.
HANDY MAN. Tiverton Gas-Works.

Situations Wanted.

SUPERINTENDENT Distribution Department. No. 4271.
MANAGER. Incandescent Mantle Factory. L F., Bollingbroke Grove, S.W.

Examinations in Gas Manufacture Classes.

No. 4263.

Works to Lease. No. 4269.

Plant Wanted.

OXIDE PURIFIER. William Brothers, Prestwich.

Stocks and Shares.

ALEX. WRIGHT & Co. Garside, Market Drayton.
SOUTHEND WATER COMPANY. Oct. 18.

TENDERS FOR

Benzol.

ROCHDALE GAS DEPARTMENT. Tenders by Oct. 5.

Breeze.

SWANSEA GASLIGHT COMPANY.

Coal.

ROTHERHAM GAS DEPARTMENT. Tenders by Sept. 30.

Coke.

RAMSGATE GAS DEPARTMENT. Tenders by Oct. 8.

Fire Clay Goods.

ROTHERHAM GAS DEPARTMENT. Tenders by Oct. 17.
NELSON GAS DEPARTMENT. Tenders by Oct. 12.

Pipes, &c.

RAMSGATE GAS AND WATER DEPARTMENT. Tenders by Oct. 8.

Tar and Ammoniacal Liquor, &c.

BRADFORD GAS DEPARTMENT. Tenders by Oct. 6.
NORTHWICH GAS COMPANY. Tenders by Oct. 7.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 866.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
100,000	10	,,	7½	Do. 7 p.c.	13¼—14½	..	5 3 5
220,000	5	May 12	6¾	Bombay, Ltd.	6¾—6¾	..	4 19 4
140,000	5	,,	6½	Do. New, £4 paid	4¾—5¼	..	4 18 11
50,000	10	Aug. 31	14	Bourne-) 10 p.c.	28—29	..	4 16 7
251,800	10	,,	7	mouth Gas) B 7 p.c.	14½—15½	..	4 10 4
53,200	10	,,	6	and Water) Pref. 6 p.c.	14—15	..	4 0 0
380,000	Stk.	Aug. 12	12	Brentford Consolidated	235 240	..	5 0 0
300,000	,,	,,	9	Do. New	178—183	+1	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	June 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	207—212*	..	5 3 9
246,320	,,	,,	8	Do. A. Ord. Stk.	146—151*	..	5 6 0
400,000	20	Apl. 14	10	British	39½—40¼	..	4 18 2
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c.	114—118	..	5 1 9
165,700	,,	,,	4½	Do. do. 3½ p.c.	88—93	..	4 16 9
500,000	0	May 12	7	Buenos Ayres (New) Ltd.	11¼—11⅝	+⅛	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 14	8¼	Cagliari, Ltd.	22—24	+1	6 17 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Apl. 28	4½	Do. 4½ p c Pref.	9¼—9¾	..	4 12 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0
1,375,000	Stk.	Aug. 31	5⅛	Commercial 4 p c Stk.	108—112	..	4 12 10
560,000	,,	,,	5	Do. 3½ p.c. do.	104—107	..	4 13 6
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	June 10	6	Continental Union, Ltd.	102—107	..	5 12 2
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,090	10	July 14	11	European, Ltd.	19½—20½	..	5 7 4
354,060	10	,,	11	Do. £7 10s paid	13½—14½	..	5 13 9
15,243,200	Stk.	Aug. 12	4 4/16	Gas-) 4 p.c. Ord.	93—95	..	4 12 6
2,600,000	,,	,,	3½	light) 3½ p.c. max.	87—89	+1	3 18 8
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	June 29	3	Coke) 3 p.c Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95*	..	5 5 3
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental	201—204	..	4 18 0
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb Red.	95—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	112—117	..	5 2 7
561,000	Stk.	Aug. 31	10	Liverpool United A	218—220	+1	4 10 11
718,100	,,	,,	7	Do. do. B	156—158	−2½	4 8 7
306,083	,,	June 29	4	Do. do. Deb. Stk.	106—108	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
560,000	100	Apl. 5	5	Met. of) 5 p.c. Deb.	102—105	..	4 15 3
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd.	10—11	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	104½—105	..	4 5 9
406,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd.	140—145	..	5 10 4
600,000	5	Sept. 15	7	Ottoman, Ltd.	5⅞—6⅛*	..	5 12 0
235,005	Stk.	—	6¼	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord.	4⅜—5⅛	+⅜	4 15 3
796,980	5	July 28	5	Do. 5 p.c. Pref.	4¼—4¾	+¼	5 5 3
492,000	100	June 1	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
851,070	10	Apl. 28	7	River Plate Ord.	11¼—11⅜	+⅛	5 19 2
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
250,000	10	Sept. 15	6	San Paulo, Ltd.	11—12*	..	5 0 0
70,000	50	June 29	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 10	10	Sheffield A	237—239	..	4 3 8
209,984	,,	,,	10	Do. B	236—238	..	4 4 0
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
123,998	Stk.	—	5	Shrews' ury Ord. 5 p.c.	—	..	—
70,000	10	May 27	11	South African	15—16	..	6 17 6
6,250,000	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	125—127	+1	4 6 8
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 31	5⅓	S'th Suburb'n Ord. 5 p.c.	115—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—123	..	4 1 4
112,533	,,	July '4	5	Do. 5 p c. Deb. Stk.	133—138	..	3 12 6
380,940	Stk.	May 12	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p.c.	118—123	..	5 1 8
325,520	,,	,,	4¾	and) B 3½ p.c.	95—100	..	4 15 0
182,380	10	June 10	8	Edmonton)			
149,900	10	July 1	5	Tuscan, Ltd.	8½—8⅝	..	9 2 10
30,000	Stk.	Aug. 31	7¼	Do. 5 p.c. Deb. Red.	96—8	..	5 2 0
255,636	,,	,,	6¼	Wands-) A 5 p.c.	150—155	..	5 0 0
50,000	,,	,,	5 17/20	worth) B 3½ p.c.	120—125	..	5 0 0
59,416	,,	June 29	3	and) C 3½ p.c.	102—107	..	4 18 2
745,872	,,	Aug. 12	5	Putney) 3 p.c. Deb. Stk.	78—83	..	3 12 8
85,000	,,	,,	5	West Ham 5 p.c. Ord.	95—100	..	5 0 4
160,000	,,	June 29	4	Do. 5 p.c. Pref.	115—120	..	4 3 4
				Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div.

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Gives no Back Pressure.
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Can be Exchanged for Spent Oxide.

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Late Works Manager in large factory in England seeks Engagement. Practical in all Branches. Moderate salary to commence.

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A LOCAL Authority about 80 miles from London desires the occasional services (say 4 or 5 times a year) of a Certificated GAS EXAMINER, to test the Gas supplied by the local Gas Company.

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WANTED at once, a Smart All-round HANDY MAN, used to fitting in Compo., Brass, or Iron, quick at Slot Work, Fixing Meters, Stoves, and Main and Service Laying, able to do all Repairs on Works, including rough Smith Work, and accurate in Reading Meters. Must be Reliable and Steady, Abstainer preferred, keep his place, and be able to Control Men in Manager's absence. Age about 30. Wages, 30s. per week, with chance of rise. References only required. Please do not apply if not used to above work, as it would cause inconvenience to yourself if appointed.

State Age and whether Married or Single to C. JEFFERY, Manager, Gas-Works, Tiverton, DEVON.

WANTED, an Oxide of Iron Purifier (Second-Hand).

State Size and Price to WILLIAM BROTHERS, Beechwood, Prestwich, near MANCHESTER.

NEW "Cripps" Washer, 8-inch Bye-Pass, in Stock. Will sell cheap.

FIRTH BLAKELEY & Co., Gas Engineers, DEWSBURY.

TO BRICK AND CEMENT MAKERS AND OTHERS.

THE Swansea Gaslight Company have for sale good ordinary COKE BREEZE, for Shipment or on Rail.

Apply MANAGER, Gas-Works, SWANSEA.

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Address Mr. T. H. GARSIDE, Solicitor, MARKET DRAYTON.

BOROUGH OF NELSON.

FIRE-CLAY GOODS.

THE Gas Committee invite Tenders for the supply of FIRE-CLAY GOODS for Season 1905.

Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.

Tenders, endorsed "Fire-Clay Goods," and addressed to the undersigned, must be received not later than Wednesday, the 12th of October, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson, Sept. 24, 1904.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the purchase of their surplus TAR for One Year.

Form of Tender, with any further Information required, may be had on application to Mr. C. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tenders for Tar," to be sent to me on or before Thursday, Oct. 6, 1904.

The highest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Sept. 24, 1904.

COUNTY BOROUGH OF ROTHERHAM.

(GAS DEPARTMENT.)

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS as required for the ensuing season.

Tenders to be endorsed "Fire Goods," and sent to the Town Clerk not later than Oct. 17.

Tender Forms and further Particulars may be obtained from the undersigned.

FRANK A. WINSTANLEY,
Engineer and Manager.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

COUNTY BOROUGH OF ROTHERHAM.
(Gas Department.)

THE Gas Committee are prepared to receive TENDERS for the supply of CANNEL.
Particulars may be obtained from the undersigned.
Tenders to be addressed to the Town Clerk, endorsed "Tender for Cannel," on or before Sept. 30 next.
Frank A. Winstanley,
Engineer and Manager.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the surplus TAR produced at these Works during the Year ending Sept. 30, 1905.
Coal Carbonized, about 6000 Tons.
Any further Particulars requested can be had on application to the undersigned.
Tenders, endorsed "Tar" and addressed to the Chairman, must be delivered here not later than Ten a.m. on Friday, Oct. 7, 1904.
Saml. S. Mellor,
Manager and Secretary.
Gas-Works, Northwich,
Sept. 16, 1904.

BOROUGH OF ROCHDALE.

TO TAR DISTILLERS AND OTHERS.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the supply of 26,000 Gallons of 90 per cent. BENZOL, to be delivered between October 1, 1904, and March 31, 1905.
Forms of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works.
Tenders, endorsed "Benzol," must be sent in to me not later than noon on Wednesday, October 5, 1904.
By order,
Wm. Henry Hickson,
Town Clerk.
Town Hall, Rochdale, Sept. 23, 1904.

RAMSGATE CORPORATION.
(Gas and Water Department.)

THE Committee invite Tenders for the purchase of their surplus COKE from Oct. 1, 1904, to Sept. 30, 1905. Probable quantity, 2000 to 3000 Tons. Delivered free on rail or free into barge, Ramsgate, purchaser paying dues.
Tenders to be sent in not later than Noon on Saturday, Oct. 8, 1904, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, and endorsed "Tender for Coke."
The Committee do not bind themselves to accept the highest or any Tender.
T. N. Ritson,
Engineer and Manager.
Gas and Water Offices,
Boundary Road, Ramsgate.

RAMSGATE CORPORATION.
(Gas and Water Department.)

TENDERS are invited for 450 8-inch and 2000 6-inch CAST-IRON WATER-PIPES, in 9 feet lengths, together with about 5 Tons of TEES, BENDS, &c.
Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, Gas and Water Offices, Boundary Road, Ramsgate, not later than Noon on Saturday, Oct. 8, 1904, endorsed "Tender for Pipes."
Specification and full Particulars on application to the undersigned.
The Committee do not bind themselves to accept the lowest or any Tender.
T. N. Ritson,
Engineer and Manager.
Gas and Water Offices,
Boundary Road, Ramsgate.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

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NOTICE is Hereby Given, that the Creditors of the above-named Company, which is being voluntary wound up, are required on or before the 1st day of November, 1904, being the day for that purpose fixed by the undersigned, to send their names and addresses, and the particulars of their debts or claims, and the names and addresses of their Solicitors (if any), to us the undersigned the Liquidators of the said Company, addressed to care of Messrs. Woolley, Beardsleys, and Bosworth, Solicitors, Loughborough, and, if so required by notice in writing from us, are by their Solicitors to come in and prove their said debts or claims, at such time and place as shall be specified in such notice, or in default thereof they will be excluded from the benefit of any distribution made before such debts are proved.
Dated this 24th day of September, 1904.
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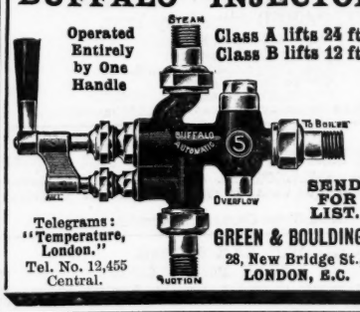

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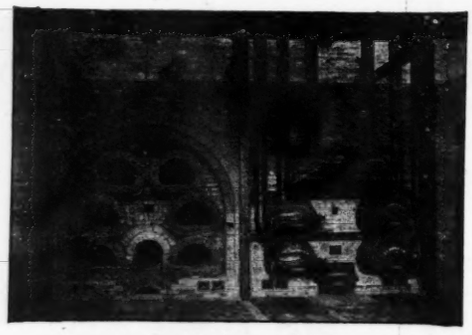

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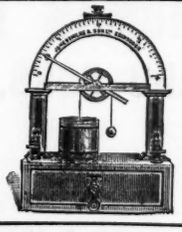

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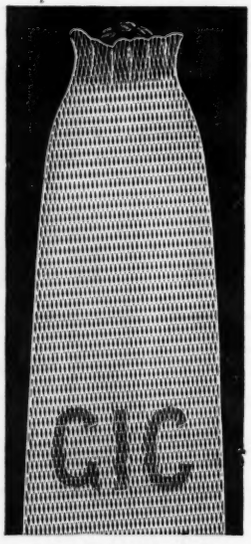

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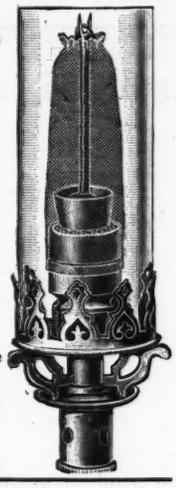

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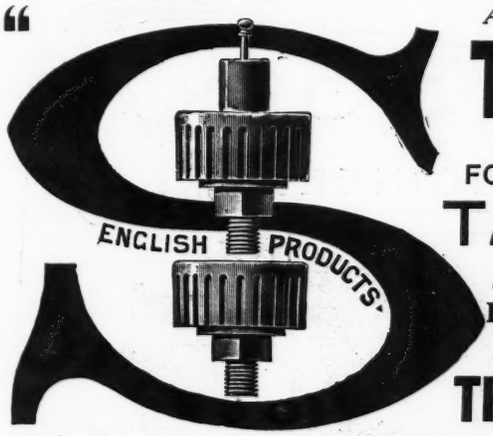

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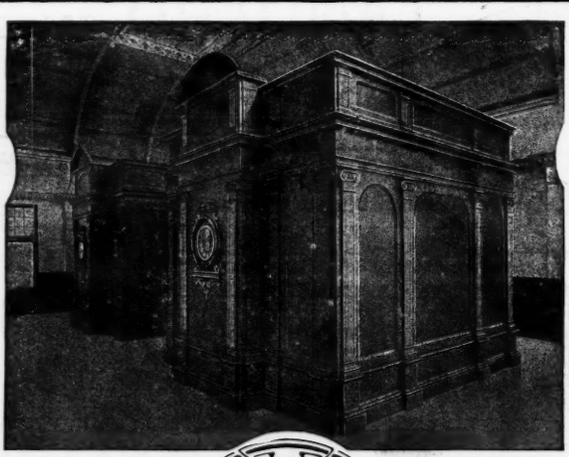

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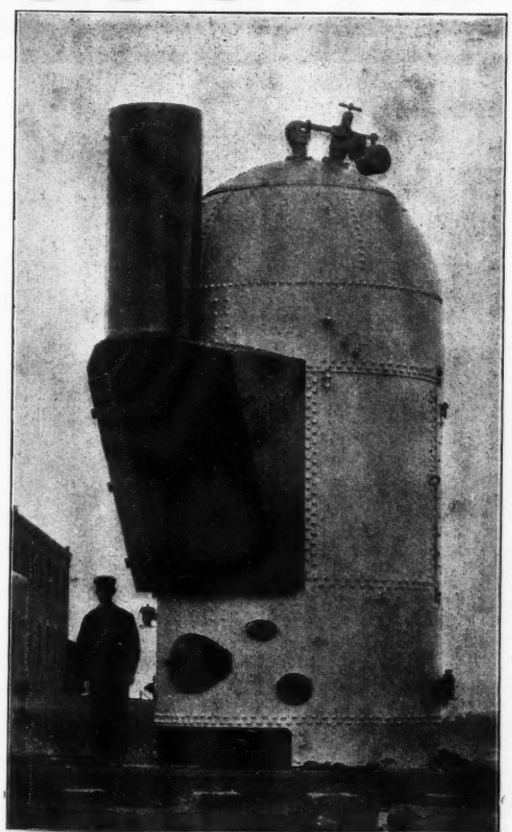

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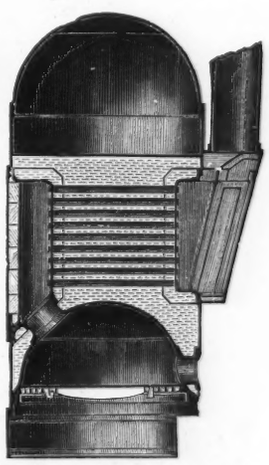

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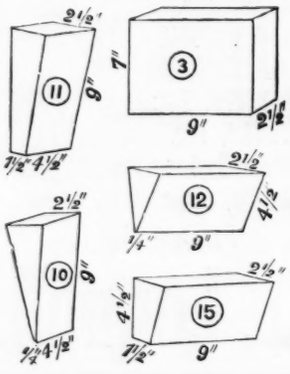

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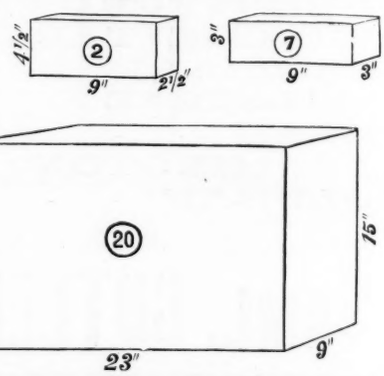

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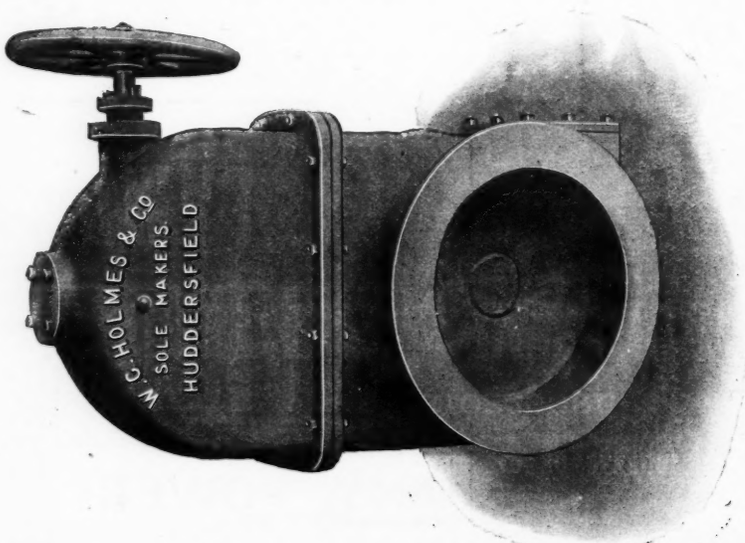

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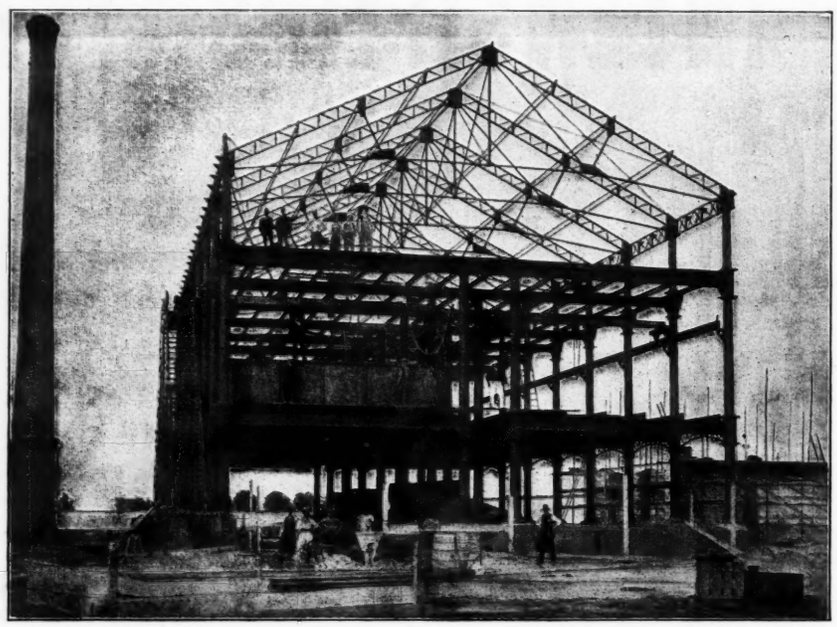

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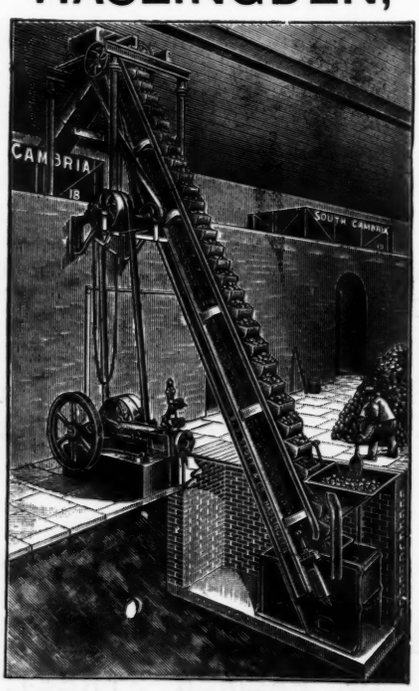

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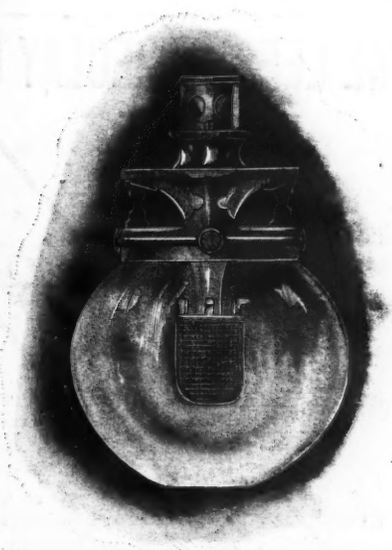

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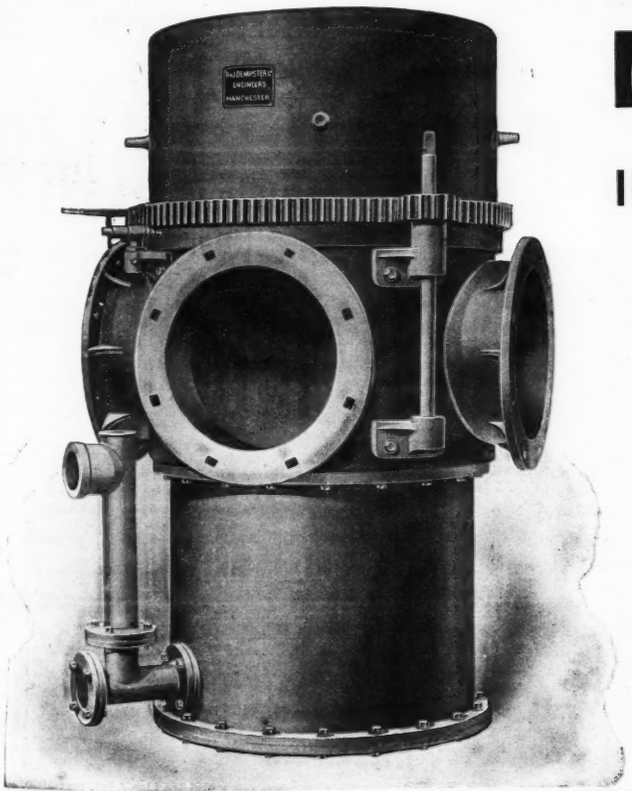

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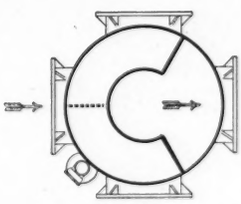

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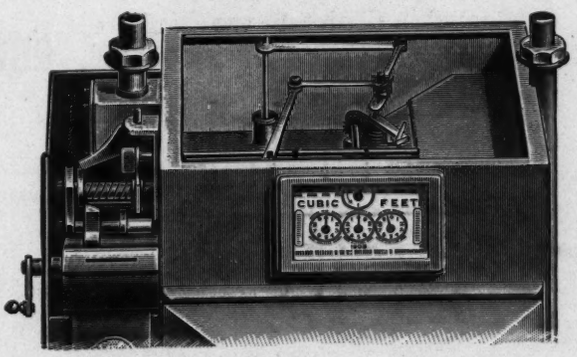

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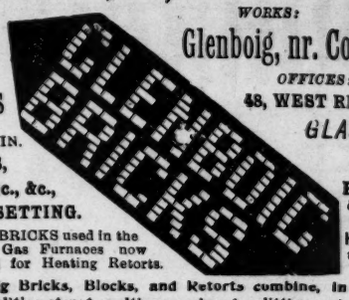

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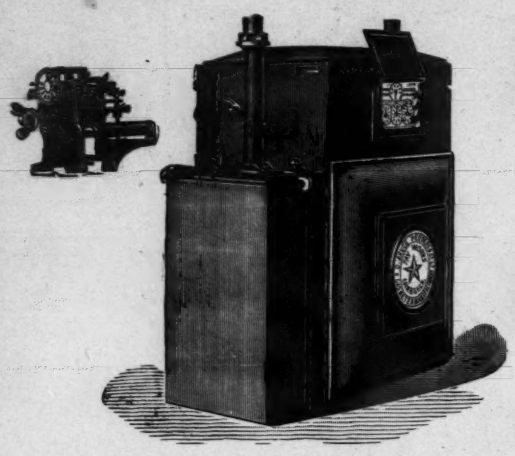

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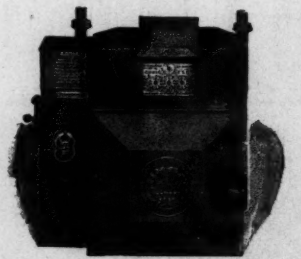

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